

WAH YEE ASSOCIATES
ARCHITECTS & PLANNERS

42400 Grand River Avenue, Suite 200
Novi, Michigan 48375
Phone (248)489-9160

PROJECT MANUAL
For

R+L CARRIERS

EDINBURGH, INDIANA

JOB NO. 5147

Dates:
October 11, 2021 - Issued for Bids and Permit

OWNER:

R+L Carriers
43 Emerick Street
Ypsilanti, MI 48198

STRUCTURAL ENGINEERS:

Thaddeus Shymanski, P.E.
33426 Five Mile Road
Livonia, MI 48154

MECHANICAL & ELECTRICAL ENGINEERS:

Clark Trombley Randers (CTR)
Consulting Engineers
504 S. Creyts Road, Suite B
Lansing, MI 48917

TABLE OF CONTENTS

	<u>PAGES</u>
Cover Sheet	1 Inclusive
Table of Contents	1 thru 3
 <u>DIVISION 00 - BIDDING AND CONTRACT REQUIREMENTS</u>	
Provided by Owner	
 <u>DIVISION 01 - GENERAL REQUIREMENTS</u>	
Section 01 01 00 - General Scope of Work	1 thru 3
Section 01 15 00 - Contract Standards and Procedures	1 thru 8
Section 01 33 23 - Shop Drawings and Samples	1 thru 5
Section 01 45 23 - Testing and Inspecting Services	1 thru 4
Section 01 64 00 - Owner Furnished Items	1 thru 2
Section 01 70 00 - Project Closeout	1 thru 4
 <u>DIVISION 02 - EXISTING CONDITIONS</u>	
Section 02 32 00 - Soil Investigation Reports	56 Pages
 <u>DIVISION 03 - CONCRETE</u>	
Section 03 00 50 - Concrete Foundation Work	1 thru 9
Section 03 30 00 - Cast-In-Place Concrete	1 thru 14
Section 03 35 00 - Concrete Finishing	1 thru 6
Section 03 41 13 - Structural Precast Concrete	1 thru 7
 <u>DIVISION 04 - MASONRY</u>	
Section 04 20 00 - Masonry	1 thru 17
 <u>DIVISION 05 - METALS</u>	
Section 05 40 00 - Cold Formed Metal Framing	1 thru 9
Section 05 50 00 - Miscellaneous Metal Work	1 thru 14
 <u>DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES</u>	
Section 06 10 00 - Rough Carpentry	1 thru 5
Section 06 20 00 - Finish Carpentry	1 thru 6
Section 06 41 16 - Plastic Laminated Clad Architectural Cabinets	1 thru 7
 <u>DIVISION 07 - THERMAL AND MOISTURE PROTECTION</u>	
Section 07 13 00 - Sheet Waterproofing	1 thru 5
Section 07 21 00 - Thermal Insulation	1 thru 7
Section 07 21 13 - Board Insulation	1 thru 3
Section 07 21 19 - Foamed-In-Place Insulation	1 thru 5
Section 07 24 00 - Exterior Insulation and Finish system	1 thru 13
Section 07 53 23 - Fully Adhered Roofing System	1 thru 12
Section 07 60 00 - Sheet Metal Work	1 thru 6
Section 07 70 00 - Roof and Wall Specialties and Accessories	1 thru 6
Section 07 72 53 - Snow Guards	1 thru 4
Section 07 84 56 - Fire Safing	1 thru 3
Section 07 90 00 - Joint Protection	1 thru 7

DIVISION 08 - OPENINGS

Section 08 11 13 - Hollow Metal Doors and Frames	1 thru 8
Section 08 33 23 - Overhead Coiling Doors	1 thru 6
Section 08 41 00 - Entrances and Storefronts	1 thru 9
Section 08 56 19 - Pass-Thru Windows	1 thru 5
Section 08 70 00 - Finish Hardware	1 thru 7
Section 08 80 00 - Glazing	1 thru 7

DIVISION 09 - FINISHES

Section 09 22 16 - Non-Structural Metal Stud Framing	1 thru 8
Section 09 28 13 - Cementitious Backing Boards	1 thru 4
Section 09 29 00 - Gypsum Wallboard	1 thru 8
Section 09 31 00 - Thin Set Tile Work	1 thru 9
Section 09 51 13 - Acoustical Panel Ceilings	1 thru 5
Section 09 65 13 - Resilient Bases and Accessories	1 thru 4
Section 09 77 00 - Special Wall Surfacing (Fiberglass Reinforced Plastic Panels)	1 thru 4
Section 09 81 00 - Acoustic Insulation	1 thru 4
Section 09 91 13 - Exterior Painting and Finishing	1 thru 9
Section 09 91 23 - Interior Painting and Finishing	1 thru 11

DIVISION 10 - SPECIALTIES

Section 10 14 00 - Signage	1 thru 4
Section 10 21 13 - Toilet Compartments	1 thru 5
Section 10 28 13 - Toilet Accessories	1 thru 6
Section 10 44 00 - Fire Protection Specialties	1 thru 4
Section 10 50 00 - Lockers	1 thru 3

DIVISION 11 - EQUIPMENT

Section 11 13 00 - Loading Dock Equipment	1 thru 4
---	----------

DIVISION 12 - FURNISHINGS

Section 12 36 23.13 - Plastic Laminate-Clad Countertops	1 thru 5
---	----------

DIVISION 13 - SPECIAL CONSTRUCTION

Section 13 34 19 – Metal Building Systems	1 thru 14
---	-----------

DIVISION 14 - CONVEYING EQUIPMENT

Section 14 92 00 - Pneumatic Tube System	1 thru 4
--	----------

DIVISION 21 - FIRE SUPPRESSION

Section 21 05 00 - Common Work Results for Fire Suppression	1 thru 3
Section 21 12 00 - Fire Suppression Standpipes	1 thru 2
Section 21 13 00 - Fire-Suppression Sprinkler Systems	1 thru 3
Section 21 24 00 – Dry-Chemical Fire-Extinguishing System	1 thru 2

DIVISION 22 - PLUMBING

Section 22 05 23 - General-Duty Valves for Plumbing Piping	1 thru 2
Section 22 05 53 - Identification for Plumbing Piping and Equipment	1 thru 1
Section 22 07 19 - Plumbing Piping Insulation	1 thru 1
Section 22 10 05 - Plumbing Piping	1 thru 6
Section 22 10 06 - Plumbing Piping Specialties	1 thru 3
Section 22 15 00 - General-Service Compressed-Air Systems	1 thru 1
Section 22 30 00 - Plumbing Equipment	1 thru 2
Section 22 40 00 - Plumbing Fixtures	1 thru 7

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

Section 23 05 13 - Common Motor Requirements for HVAC Equipment	1 thru 2
Section 23 05 93 - Testing Adjusting and Balancing for HVAC	1 thru 2
Section 23 07 13 - Duct Insulation	1 thru 2
Section 23 11 23 - Facility Natural-Gas Piping	1 thru 1
Section 23 23 00 - Refrigerant Piping	1 thru 2
Section 23 34 23 - HVAC Power Ventilators	1 thru 2
Section 23 37 00 - Air Outlets and Inlets	1 thru 2
Section 23 40 00 - HVAC Air Cleaning Devices	1 thru 1
Section 23 81 26.13 - Small-Capacity Split-System Air Conditioners	1 thru 2

DIVISION 26 - ELECTRICAL

Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables	1 thru 9
Section 26 05 26 - Grounding and Bonding for Electrical Systems	1 thru 5
Section 26 05 29 - Hangers and Supports for Electrical Systems	1 thru 4
Section 26 05 33.13 - Conduit for Electrical Systems	1 thru 10
Section 26 05 33.16 - Boxes for Electrical Systems	1 thru 5
Section 26 05 53 - Identification for Electrical Systems	1 thru 6
Section 26 05 83 - Wiring Connections	1 thru 2
Section 26 21 00 - Low-Voltage Electrical Service Entrance	1 thru 3
Section 26 22 00 - Low-Voltage Transformers	1 thru 4
Section 26 23 00 - Low-Voltage Switchgear	1 thru 6
Section 26 24 13 - Switchboards	1 thru 5
Section 26 24 16 - Panelboards	1 thru 6
Section 26 27 26 - Wiring Devices	1 thru 5
Section 26 28 13 - Fuses	1 thru 2
Section 26 28 16.13 - Enclosed Circuit Breakers	1 thru 3
Section 26 28 16.16 - Enclosed Switches	1 thru 3
Section 26 36 00 - Transfer Switches	1 thru 6

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

Section 28 46 00 - Fire Detection and Alarm	1 thru 7
---	----------

DIVISION 31 - EARTHWORK

Section 31 23 16 - Foundation Excavation and Backfill	1 thru 5
---	----------

DIVISION 32 - EXTERIOR IMPROVEMENTS

Section 32 31 13 - Chain Link Fences and Gates	1 thru 6
Section 32 31 29 - Wood Fences and Gates	1 thru 3

SECTION 01 01 00GENERAL SCOPE OF WORK

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

A. Work Included: The Project generally consists of, but is not necessarily limited to, the following:

1. One-Story Terminal and Office Building including select interior finishes as indicated on the Drawings.
2. One Story Maintenance Building.
3. One Story Truck Wash Building.
4. Fuel Station.
5. Truck and Employee Entrance Gates.
6. Exterior Steel Stair Constructions.

B. Work Not Included:

1. Site Work by Site Contractor.
2. Landscape Work by Landscape Contractor.
3. All Items Noted “N.I.C.” (Not In Contract) on Drawings.

1.02 MANDATORY SITE VISIT

A. Prior to submitting Bid Proposal, all Contractors shall visit the Project site and compare existing field conditions with Drawings and Specifications. No allowance will be made to the Contract by reason of failure of not having made an examination, or for any error due to inadequate investigation.

1.03 CONTRACT DOCUMENTS

A. Requirements for all Work shall be executed in strict accordance with the following:

1. The Contract.
2. The Drawings.
3. The Approved Shop Drawings.
4. The General Conditions and Supplementary General Conditions.
5. The Specifications, Addenda and Bulletins.

6. The Change Orders and Directives received from the Owner and/or Architect.
 7. Warranties and Guarantees in accordance with requirements of the Contract Documents, with period of Warranty as stated therein; except if Contractor neglects to correct or complete Work in Punch Lists during period of Warranty and/or Guaranty, Contractor is still responsible and required to do so after expiration dates of Warranty or Guaranty until the corrective Work is completed and accepted by the Owner.
 8. The governing Building Code, all governing laws, ordinances, rules, permits, regulations and directives from governing authorities having jurisdiction over this Work.
 9. The approved Construction Time and Sequence Schedule.
 10. Cooperation with other Contractors employed on the Project by the Owner under separate contracts. Cooperation shall include, but not be limited to, written notices to others when required to implement proper coordination of the Work and to maintain the Construction Time and Sequence Schedule.
- B. Intent of Contract Documents: Work not particularly detailed, marked, or specified shall be the same as similar parts that are detailed, marked, or specified. Should an error occur in the Specifications or Drawings, or in Work by others affecting this Work, the Contractor shall at once notify the Architect who will issue instructions as to procedure. If the Contractor proceeds with the Work based on such an error without instructions from the Owner, the Contractor shall make good any resulting damage or defects. This includes Specification typographical errors and Drawing notational errors where the intent is doubtful.
- C. Conflicts: In the event of a conflict or need for interpretation between the Working Drawings and Specifications, the Architect shall be the sole interpreter of the Drawings and Specifications, to determine which, if any will take precedence.
- D. Requests for Information (RFIs)
1. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 - a. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
 - b. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
 2. Content of the RFI: Include a detailed, legible description of item needing information or interpretation along with standard project identifications.
 3. RFI Forms: AIA Document G716, CSI Form 13-2A or approve Contractor's Form.
 4. Architect's/Owner's Action: Architect and/or Owner will review each RFI, determine action required, and respond.
 5. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number.
- E. Field Revisions
1. Any Changes in plan arrangement or detailing and specific instructions for the project without the prior written notification and approval of the Architect will void any obligations and liabilities set forth by the Owner and the Architect.

2. If any substitutions are approved for specific equipment, the General Contractor and his subcontractors shall be responsible for all coordination including HVAC, plumbing and electrical.
 3. All material specified is to be installed in accordance with manufacturers instructions and specifications. The General Contractor is to construct the project in accordance with the documents. Any deviations from the intent of the documents without the Architects written approval is at the contractor's own risk and may result in the work being redone at the contractor's expense.
 - a. Apply, install, connect, and erect manufactured items or materials according to the recommendations of the manufacturer when such recommendations are not in conflict with Contract Documents. If there is a conflict, the Architect is to be notified.
 - b. Furnish, on request, copies of manufacturer's recommendations to the Architect before proceeding with Work.
 4. In the event that the quality or grade of material is not clearly specified, the General Contractor shall request clarification from the Architect. Under no circumstances shall the contractor assume grade or quality.
- F. Requirements of Regulatory Agencies: Furnish and install materials in strict compliance with the laws, codes, ordinances and regulations of the public authorities having jurisdiction over this Project, including "ICC/ANSI - A117.1 - Standard on Accessible and Usable Buildings and Facilities" and "Title III of The Americans With Disabilities Act (ADA), Public Law 101-336".

1.04 QUALITY ASSURANCE

- A. Standards: All exterior building materials and systems shall meet local building code requirements for fire spread, uplift resistance, and wind loads.

1.05 PROHIBITED SUSPENSION OF MATERIALS FROM METAL DECK

- A. Suspension of any material or equipment from metal deck is strictly prohibited. Items not allowed to be attached to or suspended from the metal deck include but are not limited to mechanical or electrical equipment, ducts, piping, light fixtures, or other decorative structures.

1.06 HAZARDOUS MATERIALS

- A. The building(s) shall be free of hazardous materials according to applicable federal, state, and local environmental regulations.

1.07 ASBESTOS FREE MATERIALS

- A. No asbestos, or products containing asbestos, shall be installed in this Project. General Contractor shall provide to the Owner at completion of construction an affidavit certifying that the Project is free of all asbestos - containing materials.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 15 00CONTRACT STANDARDS AND PROCEDURES

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: This section consists of establishing standards and procedures.

1.02 OPERATIONS

- A. Layout: Locate and layout the Work and establish lines and levels accurately. Report any discrepancies to the Architect immediately upon discovery.
- B. Use of Premises: Confine apparatus, storage of materials, and operations of workmen to limits indicated by law, ordinance, permit, or arrangement with the Owner. Do not unreasonably encumber the premises with materials.
- C. Requests for Information (RFI's)
1. General: Immediately on discovery of need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit a PDF of the RFI in the form specified to the Owner's Project Manager.
 - a. Project Manager will return RFI's submitted to Project Manager by other entities controlled by Contractor with no response.
 - b. Coordinate and submit RFI's in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
 2. Content of the RFI: Include a detailed, legible description of item needing information or interpretation along with standard project identifications.
 3. RFI Forms: AIA Document G716, CSI Form 13-2A or approve contractor's form.
 4. Action: Project Manager will review each RFI, determine action required, and respond. Allow two working days for Architect's response for each RFI. RFI's received by Project Manager after 1:00 p.m. will be considered as received the following work day.
 - a. Project Manager's action may include a request for additional information, in which case Project Manager's time for response will date from time of receipt of additional information.
 - b. Project Manager's request for additional information shall be answered within two days unless otherwise noted.
 5. RFI Log: Prepare, maintain, and submit a tabular log of RFI's organized by the RFI number.

D. Project Meetings:

1. Progress Meetings: Schedule and conduct regular periodic progress meetings. All Key personnel of Contractor and Subcontractors shall attend. Notify other parties as the Owner's Representative or Architect might designate, as job conditions and progress might warrant.
 - a. Contractor's Construction Schedule: Review progress since last meeting, determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to the Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that correct and subsequent activities will be completed within Contract Time.
 - 1) Review schedule for next scheduled progress meeting period.
 - b. Agenda: Review present and future needs of each entity present, including the following:
 - 1) Interface requirement.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access and site utilization.
 - 7) Temporary facilities and controls.
 - 8) Progress Cleaning.
 - 9) Quality and Work standards.
 - 10) Status of correction of deficient items.
 - 11) Field observations.
 - 12) Status of RFIs.
 - 13) Status of proposal requests.
 - 14) Pending changes and Status of Change Orders.
 - 15) Pending claims and disputes.
 - 16) Documentation of information for payment requests.
 - c. Meeting Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
2. Preconstruction Meeting: Schedule and conduct a preconstruction meeting before starting construction, at a time convenient to Owner and Architect, but no later than fifteen (15) days after execution of the Agreement. All Key personnel of Owner, design professionals and Contractors shall attend. Notify other parties as the Owner's Representative or Architect might designate, as job conditions and progress might warrant.

- a. Agenda: Discuss items of significance that could affect progress, including the following:
- 1) Tentative construction schedule.
 - 2) Phasing and Staging.
 - 3) Critical Work sequencing and long-lead items.
 - 4) Designation of key personnel and their duties.
 - 5) Lines of communications.
 - 6) Procedures for processing field decisions and Change Orders.
 - 7) Procedures for RFIs.
 - 8) Procedures for testing and inspecting.
 - 9) Procedures for processing Application for Payment.
 - 10) Distribution of the Contract Documents.
 - 11) Submittal procedures.
 - 12) Preparation of record documents.
 - 13) Use of the premises.
 - 14) Work restrictions.
 - 15) Working hours.
 - 16) Owner's occupancy requirements.
 - 17) Responsibility for temporary facilities and controls.
 - 18) Procedures for moisture and mold control.
 - 19) Procedures for disruptions and shutdowns.
 - 20) Construction waste management.
 - 21) Parking Availability.
 - 22) Office, Work, and storage areas.
 - 23) Equipment deliveries and priorities.
 - 24) First Aid.
 - 25) Security.
 - 26) Progress cleaning.
 - 27) Safety.
- b. Meeting Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

3. Preinstallation Meetings: Conduct a preinstallation meeting at Project site before each construction activity that requires coordination with other construction. All Key personnel of Contractor, Subcontractors, and manufacturer's representative(s) shall attend. Notify other parties as the Owner's Representative or Architect might designate, as job conditions and progress might warrant.
 - a. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - 1) Contract Documents.
 - 2) Options.
 - 3) Related RFIs.
 - 4) Related Change Orders.
 - 5) Purchases and Deliveries.
 - 6) Submittals.
 - 7) Review of Mockups.
 - 8) Possible conflicts and Compatibility problems.
 - 9) Time schedules and weather limitations.
 - 10) Manufacturer's written recommendations.
 - 11) Warranty requirements.
 - 12) Compatibility of materials and acceptability of substrates.
 - 13) Temporary facilities and controls.
 - 14) Space and access limitations.
 - 15) Regulations of authorities having jurisdiction.
 - 16) Testing and inspecting requirements.
 - 17) Installation procedures and coordination with other Work.
 - 18) Required performance results.
 - 19) Protection of adjacent Work, construction and personnel.
 - b. Meeting Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
4. Project Closeout Meetings: Schedule and conduct a Project closeout meeting, at a time convenient to Owner and Architect, but no later than ninety (90) days prior to the scheduled date of Substantial Completion. All Key personnel of Contractor, Subcontractors, Owner, and design professionals shall attend. Notify other parties as the Owner's Representative or Architect might designate, as job conditions and progress might warrant.

- a. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - 1) Submission of record documents.
 - 2) Procedures required prior to inspection for Substantial Completion and for Final inspections for acceptance.
 - 3) Submittal of written warranties.
 - 4) Requirements for preparing operations and maintenance data.
 - 5) Requirements for demonstrations and training.
 - 6) Preparation of Contractor's punch list.
 - 7) Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - 8) Submittal Procedures.
 - 9) Coordination of separate contracts.
 - 10) Owner's partial occupancy requirements.
 - 11) Responsibility for removing temporary facilities and controls.
- b. Meeting Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

1.03 RECORDS

- A. Record Drawings: Maintain on site a complete set of Construction Documents and Shop Drawings as required by Section 01 70 00 - Project Closeout.

1.04 SUBMITTALS

- A. Subcontractor List: Submit list of subcontractors with addresses, telephone numbers and e-mail addresses for approval within twenty-four (24) hours after notification of intent to enter into Contract. Prepare list on the form of a sworn statement attesting to the validity of such. Do not change the name of subcontractors or vendors on the approved list without the specific written form stating sufficient reason to warrant such a change.
- B. Schedule of Values: Prepare detailed accounting of Contract Sum on the basis of "trades" Sections indicated in the Project Manual - Table of Contents. Submit and obtain approval before first application for payment. Use only approved breakdown for payment requests.
- C. Payment Schedule: Submit to the Architect at least twenty (20) days prior to the submission of the first request for payment, a schedule detailing projected monthly requests for payment for the duration of the Project.
- D. Shop Drawings and Samples:
 - 1. Refer to Section 01 33 23 - Shop Drawings and Samples.
 - 2. In addition to Section 01 33 23, the Contractor shall furnish the Owner with one (1) copy of all approved Shop Drawings and manufacturers product data bound in loose leaf form, for the Owner's records, prior to Owner issuing the Certificate of Substantial Completion.

- E. Test Reports: Submit copies as required herein, with distribution as directed by the Architect.

1.05 DOCUMENTS

A. Performance and Labor and Material Payment Bonds:

1. If required, deliver to the Owner within ten (10) days of the date of the notification of intent to enter into Contract.
2. Condition bonds for the faithful performances of the Contract and for the payment of labor and material, each in the sum of 100% of the amount of the Contract as set forth in notification of intent to enter into Contract.
3. The Owner, at the Owner's discretion, reserves the right to accept or reject the company underwriting the bonds on the basis of their previous performance.

- B. Agreement: Use AIA Contract Form, unless otherwise agreed upon by Owner.

- C. Application for Payment: Use AIA Form G702 and G703.

- D. Sworn Statements: Use uniform commercial format designated by the Owner.

- E. Insurance Certificate: Use form selected by Owner. Owner may, at the Owner's option, require a certified copy of Contractor's insurance policies in addition to insurance certificates.

1.06 QUALITY CONTROL

- A. Standards: Establish a quality control system to perform sufficient inspection and tests of all Work, including Subcontractors, to ensure conformance to applicable Specifications and Drawings, with respect to materials, workmanship, construction, finish, functional performance, and identification. Control system shall specifically include observation, supervision, and tests required in the Specifications.

- B. Testing: Provide testing in accordance with Section 01 45 23 - Testing and Inspecting Services.

1.07 SCHEDULE

- A. Dates: Work shall commence and be substantially completed as specified in the Contract Agreement.

B. Schedule:

1. Prepare a "Plan of Operations and Progress Schedule" to indicate the manner in which different phases of the Work are to be started, when Shop Drawings are to be submitted, colors selected, methods and speed for progressing different phases, and dates upon which Subcontractors are dependent upon other Sub-contracts. Schedule shall indicate major items of Work, including retaining walls, foundations, column footings, equipment pads, steel erection, metal roofing, metal siding, underfloor plumbing and electrical Work, fire protection, concrete floor/slab pours, and date of Final Completion.
2. Plan of Operations and Progress Schedule shall be "weighted" to schedule each trade in proportion to the entire Project, physically and financially.
3. Revise schedule monthly to indicate actual progress compared to the estimated progress.
4. Post schedule in the Contractor's field office and distribute copies to the Owner, Architect, Project Representative, and all prime Subcontractors.

1.08 PAYMENT

A. Requests:

1. On or before the tenth (10th) day of each month, the Contractor shall make application for payment in quadruplicate based on percentage of completion of items of cost breakdown.
2. Each application after the first one shall be accompanied by waivers of lien and sworn statements that all labor, materials, and services included in the previous and prior statements have been paid, less only the retained percentage stated herein, and any disputed amounts which shall be stated. In addition, the Contractor shall request and file with the request for payment a sworn statement from each Subcontractor that the Contractor has direct contractual relations with.

B. Payment: The Owner shall make payments on account of each Contract as provided herein. Within thirty (30) days after submission and approval of the application for payment the Owner will pay ninety (90) percent of the value except as may be modified as follows, based on the Contract prices, including executed change orders amending the Contract, on labor and materials incorporated in the Work, and material suitably stored at the site up to the first day of that month as certified by the Architect, less the aggregate of the previous payments.

C. Retained Percentage:

1. Ten (10) percent of the estimated amounts shall be retained until the final completion and acceptance of all Work covered by the Contract.
2. The retained percentage shall be paid thirty (30) days after Owner's acceptance of the building(s), providing that all requirements of the Contract are met. Refer to Closing Procedure.

D. Substantial Completion Payment: Upon issuance of Certificate of Substantial Completion, a sum shall be paid sufficient to increase the payments to the total of the Contract, less the retained percentage.

E. Final Certificate:

1. After the Contractor has complied with the closing requirements specified herein, and provided the Architect with appropriate documentation, the Architect shall certify such, issuing a Final Certificate.
2. Issuance of such Certificate does not relieve the Contractor of the responsibilities related to guaranteeing the performance of the facility, as specified herein or otherwise provided.

1.09 CLEANING

- A. Keep the premises free from accumulation of waste materials or rubbish caused by Work operations at all times. At the completion of the Work remove all waste materials and rubbish from and about the Project, as well as all tools, construction equipment, machinery, and surplus materials.
- B. Establish and enforce a daily system for collecting and disposing waste materials from construction areas and elsewhere at Project site. Do not hold collected materials at site for more than three (3) days. Handle hazardous, dangerous, unsanitary, contaminating, pollution, and similar harmful wastes separately from inert materials by containerizing in an appropriate manner. Dispose of each category of waste material in a lawful manner. Do not bury or burn waste materials on Owner's property.

1.10 CLOSING PROCEDURES

A. Financial:

1. Furnish ample evidence to Architect and Owner that all financial obligations have been met, including sworn statements and final waivers of lien.
2. Obtain a written statement releasing the Owner and the Architect from any and all obligations which might arise out of any unpaid, defaulted, or otherwise unsatisfied accounts.

B. Punch List:

1. Complete and correct all items on the Punch List as originally issued and amended.
2. If contemplating application for final payment, schedule a joint inspection visit to the Project with the Architect one (1) week in advance to determine if the Contracts have been fully executed.

C. Record Drawings: Deliver not less than three (3) sets of documents to the office of the Architect.

D. Warranties and Guarantees:

1. Submit all written warranties and guarantees.
2. Submit as applicable, list of contacts, including company name, personal contact, address, telephone number, and e-mail address for building equipment and components which may require periodic service, including fire protection, plumbing, mechanical equipment, and electrical equipment.

E. Other Documents:

1. Furnish reports of all tests and the performance of completed systems, as required in the Specifications, and all certificates of approval.
2. Furnish all schedules, instructions, and equipment operation and service manuals as necessary to ensure safe and proper operation and maintenance of products installed in the building(s).

F. Final Certificate: Issuance of Final Certificate does not relieve the Contractors of the responsibilities related to warranting and guarantying the performance of the Work.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 33 23SHOP DRAWINGS AND SAMPLES

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SUBMITTALS

- A. Summary Listing and Schedule: General Contractor shall prepare a summary listing and schedule for submission of Shop Drawings, Samples, and Product Data to the Owner and Architect for review of the various items of Work. Schedule shall allow approximately two (2) calendar weeks or ten (10) working days for review; however, this may vary depending upon the quantity of the material submitted. Schedule shall also allow time for submission of Shop Drawings, Samples, and Brochures which may not be approved.
- B. Substitution Requests: Submit in PDF format each request for consideration. Identify product or fabrication or installation method to be replaced. Include specification section number and title and drawing numbers and titles. No substitutions will be accepted for Tenant specific items. Provide Tenant specific items as indicated on Upfit Drawings and/or Specifications.
 - 1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication, or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate Contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of signification qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirement included. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of product and fabrications and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Detailed comparison of Contractor’s construction schedule using proposed substitution with products specified for the Work, including effect on overall contract time. If specified product or method of construction cannot be provided within contract time, include letter from manufacturer, on manufacturer’s letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.

- i. Cost information, including a proposal of change, if any, in contract sum.
 - j. Contractor's certification, except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - k. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven (7) days of receipt of a request for substitution. Architect will notify Contractor through General Contractor of acceptance or rejection of proposed substitution within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Action on Undecided Proposed Substitutions: Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.
 - c. Conditions of Acceptance: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - 1) Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - 2) Requested substitution does not require extensive revisions to the contract documents.
 - 3) Requested substitution is consistent with the contract documents and will produce indicated results.
 - 4) Substitution request is fully documented and properly submitted.
 - 5) Requested substitution will not adversely affect Contractor's construction schedule.
 - 6) Requested substitution has received necessary approvals of authorities having jurisdiction.
 - 7) Requested substitution is compatible and has been coordinated with other portions of the Work.
 - 8) Requested substitution provides specified warranty.
 - 9) If requested substitution involves more than one Contractor, requested substitution has been coordinated with other products, and is acceptable to all Contractors involved.

3. Reimbursement of Architect's Costs:
 - a. In the event substitutions are proposed to the Architect after the Contract has been awarded, the Architect will record all time used by the Architect and the Architect's consultants in evaluation of each proposed substitution.
 - b. Whether or not the Architect approves a proposed substitution, the Contractor shall promptly upon receipt of the Architect's billing, reimburse the Architect at the rate of two and three-quarter (2-3/4) times the direct cost of the Architect and the Architect's consultants for all time spent in evaluating the proposed substitution.
- C. Submittals: Each Subcontractor shall submit through the General Contractor in PDF format, to the Owner's Project Manager only at proper times, all Shop Drawings, Product Data, and setting diagrams which the Project Manager may deem necessary to illustrate the Work intended or show its relation to Work of other trades. Shop Drawings and Product Data shall contain manufacturer's name, material description, sizes and dimensions, and other pertinent information. All submittals, including resubmittals, shall have Product Data identifying the materials to be supplied by circling or denoting the intended materials on the Product Data sheets. Direct submittals to the Architect or Engineers will not be reviewed.
 1. Prohibited Submittals: Contractors shall not duplicate Design/Working Drawings for use as Shop Drawings. Duplicated Drawings of this nature shall be rejected.
 2. Required Information: Include in submittals sufficient drawings, plans, elevations, sections, performance data, dimensions, bolt locations, inserts, sound data, weights and schematics to clearly describe the equipment and to show compliance with the Specifications. Provide a cover or title sheet for each submittal containing the following:
 - a. Name of Contractor originating the submittal.
 - b. Name of Project for which the submittal is made.
 - c. An index of all items submitted.
 - d. Identification of each item of material and equipment.
 - e. Date of submittal.
 - f. Contractor's certification.
- D. Deviations: Any and all deviations from the Specifications and/or Drawings must be brought to the Project Manager's attention by circling all items submitted for review.
- E. Identification: Shop Drawing submittals and transmittal letters shall be identified with title and location of Project, names of the Architect, the Contractor, and the submission date.
- F. Compliance Review: All Shop Drawings and Product Data submitted to the Project Manager shall be stamped by the General Contractor to indicate that the submittal has been reviewed for compliance with the Contract Documents, coordination between other Trade Work, and related details.
- G. Architectural and Structural Shop Drawings: The General Contractor shall submit to the Project Manager, for review, a PDF of each Drawing. After Shop Drawing has been reviewed, one copy will be returned to General Contractor.

1. If the Shop Drawings are returned “Revise & Resubmit”, the effected Contractor shall correct the original Drawings and resubmit the Shop Drawings as originally required, i.e., PDF format, to the Project Manager for review.
 2. Submit three (3) copies of Product Data such as catalog cuts and brochures.
- H. Mechanical and Electrical Shop Drawings: Submit for review of all equipment and products in PDF format. After Shop Drawing has been reviewed, PDF will be returned to the General Contractor.
- I. Required Shop Drawings: Shop Drawings are required for, but are not necessarily limited to the items as required by the Drawings and/or Specifications within the Project Manual.
- J. Review of Shop Drawings:
1. It shall be distinctly understood that the review of Shop Drawings shall be for General Scheme only. Review does not relieve the Contractor from the necessity of correcting, without charge, details on the Drawings and completed Work found deficient in strength or otherwise faulty.
 2. The Project Manager and Architect assumes no responsibility for “figured dimensions” of Shop Drawings.
 3. The review of Shop Drawings does not relieve or modify the responsibility for compliance with the Contract Documents or dimensions or errors contained in the submittal or quantity count. It is clearly understood that in the review process, noting of some discrepancies, but overlooking others, does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop Drawings, layout drawings, catalog data and brochures, the Contract Documents govern the Work, and are neither waived nor suspended in any way by the review of Shop Drawings, layout drawings, catalog data and brochures.
 4. Upon completion of the Project the Owner shall be given one (1) set of reviewed Shop Drawings.
- K. Authorization: Unless specifically otherwise required by the Owner, no materials shall be ordered, delivered, fabricated, or erected until the proper written review by the Project Manager has been received by the General Contractor.

1.02 SAMPLES AND LETTERS OF INTENT

- A. Summary Listing: General Contractor shall prepare a summary listing of the Samples and Letters of Intent submittal requirements for review by the Owner’s Project Manager.
- B. Material Samples and Letters of Intent: Samples and Letters of Intent as listed and requested in the respective trade Specifications enumerate, but do not necessarily limit, the material Samples or Letters of Intent indicating materials, specifications, and/or installation procedures, which shall be submitted for approval PRIOR to purchase or installation of materials. All material Samples shall be reviewed by the Owner’s Project Manager PRIOR to erection or fabrication.
- C. Samples: Submit to the Project Manager for review, three (3) actual Samples of all materials to be used in the Work. All Samples shall have the same finish as that to be used in the completed Work. Samples shall be accompanied by a letter requesting approval and presenting all required data.
1. Unacceptable Samples: Manufacturer’s color charts and/or color swatches shall not be acceptable as Samples.
- D. Materials: All materials furnished shall be fully equal to the reviewed Samples.

- E. Selections: Where the choice of more than one make or style of article or material is specified, the final selection of the article or material shall be made by the Owner's Project Manager.
- F. Quality, Fitness, and Workmanship: The quality or fitness of materials or workmanship shall be based on the requirements that all Work done, or materials furnished shall be first class in every respect, and what is usual or customary on other projects shall in no way enter into any consideration or decision.
- G. Differences in Price: Where any difference occurs in price of such articles or materials, such differences are to be given before the Contracts are signed. After the Contracts have been signed, the Owner reserves the right to choose whichever article or material the Owner desires, assuming, unless previously advised to the contrary, the price is not changed thereby. Where the Specifications require a specific item "equal or comparable products" or other words to that effect, the final selection will be by the Owner.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 45 23TESTING AND INSPECTING SERVICES

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPEA. Work Included:

1. Owner will obtain the services of an Independent Testing Laboratory to perform testing services for concrete, steel and other materials as required, specified or directed. The Testing Laboratory shall evaluate and approve all soils testing performed by the Project Soils Engineer.
2. Requirements for testing are described in various sections of the Specifications. Where no testing requirements are described, but the Owner determines that testing is required, the Owner may require testing to be performed under currently recognized standards for testing.

B. Related Work:

1. Selection of Testing Laboratory: The Owner will select and approve a qualified, unbiased, and recognized independent commercial testing agency.
2. Payment for Initial Testing Services: The Owner will pay for all initial services of the testing agency as specified herein under Article 1.04 PAYMENT FOR TESTING SERVICES.

1.02 CODES AND STANDARDS

- A. Testing, when required, shall be in accordance with all pertinent codes and regulations, and with selected ASTM International Standard Specifications.

1.03 TEST REPORTS AND RELATED INSTRUCTIONS

- A. Promptly process and distribute all required copies of test reports and related instructions to ensure all necessary retesting and/or replacement of materials with the least possible delay to progress of the Work.

1.04 PAYMENT FOR TESTING SERVICES

- A. Initial Services: The Owner will pay for all initial testing services. When the initial tests indicate non-compliance with the Contract Documents, the costs of all initial tests associated with that non-compliance will be deducted by the Owner from the Contract Sum.
- B. Retesting: When the initial tests indicate non-compliance with Contract Documents, all subsequent retesting occasioned by the non-compliance shall be performed by the same agency, and the costs thereof will be deducted by the Owner from the Contract Sum.

1.05 CODE COMPLIANCE TESTING

- A. Responsibility of Inspection and Testing: Inspection and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities or a legally constituted authority, shall be the responsibility of, and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

1.06 TESTING LABORATORY DUTIES

- A. Cooperation: Cooperate with Architect/Engineer and Contractor; provide qualified personnel after due notice.
- B. Perform Specified Inspections, Sampling and Testing of Materials and Methods of Construction:
1. Take all specimens and samples.
 2. Provide all sampling equipment and personnel.
 3. Make all deliveries of specimens and samples to the Testing Laboratory.
 4. Comply with specified standards.
 5. Ascertain compliance of materials, and Work, with requirements of Contract Documents.
- C. Irregularities and Deficiencies: Immediately notify Architect/Engineer, Owner's Supervising Engineer, and Contractor of observed irregularities or deficiencies of Work or products in the field or laboratory as a result of testing. All irregularities and deficiencies encountered shall not go unresolved. Testing reports submitted to Architect/Engineer shall be for file purposes only and shall include the resolution of these irregularities and/or deficiencies.
- D. Reports of Tests and Inspections: Promptly submit written report of each test and inspection; one (1) copy each to Owner's Supervising Engineer, Owner, and Contractor, and three (3) copies to Architect/Engineer. Each report shall include:
1. Date issued.
 2. Detailed listing.
 3. Project title and number.
 4. Testing Laboratory name, address and telephone number.
 5. Name and signature of laboratory inspector.
 6. Date and time of sampling or inspection.
 7. Record of temperature and weather conditions.
 8. Date of test.
 9. Identification of product and Specification section.
 10. Location of sample or test in the Project.
 11. Name of person taking sample or making test.

12. Type of inspection or test.
 13. Results of tests and compliance with Contract Documents.
 14. Interpretation of test results, when requested by Architect/Engineer.
- E. Additional Tests: Perform additional tests as required by Architect/Engineer, Owner's Supervising Engineer, or Owner.
- F. Special Inspections: Submit "Statement of Special Inspections" and a certified written report of each special inspection, test or similar service; one (1) copy each to Owner's Supervising Engineer, Owner, Contractor, and Architect/Engineer. Submit additional copies of each report to governing authority, when the authority so directs.
1. Report Data: Written inspection or test reports for the Project shall include, but shall not necessarily be limited to applicable special inspections listed below:
 - a. Inspection of Steel Construction per Building Code Section 1705.2, and as required by Structural Drawings.
 - b. Inspection of Concrete Construction per Building Code Section 1705.3, and as required by Structural Drawings.
 - c. Inspection of Soils per Building Code Section 1705.6, and as required by Structural Drawings.
 - d. Inspection for Wind Resistance per Building Code Section 1705.11, and as required by Structural Drawings.
 - 1) Components, Section 1705.11.3.

1.07 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

- A. Laboratory is not authorized to:
1. Release, revoke, alter or enlarge on requirements of Contract Documents.
 2. Approve or accept any portion of the Work.
 3. Perform any duties of the Contractor.

1.08 CONTRACTOR'S RESPONSIBILITIES

- A. General: Cooperate with laboratory personnel, provide access to Work, to material manufacturer's operations.
- B. Samples: Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.
- C. Preliminary Design Mixes: Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other materials mixes which require control by the Testing Laboratory.
- D. Test Reports: Furnish copies of Products test reports as required.

E. Furnish Incidental Labor and Facilities:

1. To provide access to Work to be tested.
2. To obtain and handle samples at the source of the product to be tested.
3. To facilitate inspections and tests.
4. For storage and curing of test samples.

F. Notification to Laboratory: Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.

1. When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to Contractor's negligence.

G. Contractor's Convenience Testing: For testing performed exclusively for Contractor's convenience, employ and pay for the services of a separate, equally qualified Independent Testing Laboratory.

H. Payment for Testing Services: Pay for services of Owner selected Testing Laboratory to extent previously specified herein under Article 1.04 PAYMENT FOR TESTING SERVICES.

1.09 SCHEDULES FOR TESTING

- A. Time Required for Testing: By advance discussion with the testing agency selected by the Owner, determine the time required for the testing agency to perform its tests and to issue each of its findings. Provide all required time within the construction schedule.
- B. Changes in Construction Schedules: When changes of construction schedules are necessary during construction, coordinate all such changes of schedules with the testing agency as required.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 64 00OWNER FURNISHED ITEMSPART 1 - GENERAL1.01 SCOPE

- A. Work Included: The Owner will purchase the following materials and equipment for incorporation into the Work by the General Contractor, including but not limited to the following:
1. Dock Approach Plates.
 2. Dock Levelers with Bumpers.
 3. Dock Stands.
 4. Back-Up Generator.
 5. Transfer Switch.
 6. Dock Door Lights.
 7. Light Fixture Package.
 8. Hose Reels and Fittings.
 9. Signage on Building and Docks.
 10. Turnstiles.
 11. Flag and Flag Pole.
 12. Dock Safety Chains.
 13. Shrink Wrap Machines.
 14. Fire Extinguishers.
 15. Propane Tank and Pump.
 16. High Volume - Low Velocity Fans.
 17. Fuel Additive Shelter.
 18. Tile and Grout - Only.
 19. Snow Scraper.

- B. Related Sections: The following items of Work will be provided under other sections of the Specifications or are N.I.C.:

1. Plumbing Work - Division 22.
2. Mechanical Work - Division 23.
3. Electrical Work - Division 26.
4. All Items Noted "N.I.C." (Not In Contract) as indicated on Drawings.

1.02 COORDINATION

- A. Contractor shall coordinate delivery of Owner furnished material, as necessary to ensure timely completion of Work.

PART 2 -PRODUCTS

2.01 PURCHASE BY OWNER

- A. Products as specified in the "Responsibilities Chart" noted on the Drawings and in this Specification Section shall be purchased by the Owner. No substitutions will be permitted.

PART 3 -EXECUTION

3.01 INSTALLATION OF OWNER FURNISHED ITEMS

- A. Installation: Install Owner furnished items as specified herein and as indicated on the Drawings per manufacturer's recommendation and written instructions.

END OF SECTION

SECTION 01 70 00PROJECT CLOSEOUT

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Closeout Work shall include preparation for final acceptance, occupancy, and similar actions evidencing completion of the Work. The time of closeout is recognized to be directly related to “Substantial Completion”, and therefore may be either a single time period for the entire Work or a series of time periods for individual parts of the Work which have been certified as substantially complete at different dates. That time variation (if any) shall be applicable to other provisions of this section, regardless of whether resulting from “phased completion” originally specified by the Contract Documents or subsequently agreed upon.

1.02 PREREQUISITES FOR SUBSTANTIAL COMPLETION

- A. General: Prior to Certification of Substantial Completion, submit one (1) set of the following documents to the Owner, and list known exceptions:
1. Submit statement showing final accounting of changes to the Contract Sum.
 2. Advise of pending insurance change-over requirements.
 3. Submit guarantees, warranties, workmanship bonds, maintenance agreements, final certifications and similar documents. Submit list of contacts, including company name, personal contact, address, telephone number and e-mail address for building equipment and components which may require periodic service, including mechanical and electrical equipment, and fire protection system.
 4. Obtain and submit occupancy permits, operating certificates, final inspection/test certificates, and similar releases enabling full and unrestricted use of the Work and access to services and utilities.
 5. Submit record (As-Built) Drawings, operation and maintenance manuals, Subcontractor listing with address, telephone number and e-mail address, final Project photographs, damage or settlement survey, property survey, and similar final record information.
- B. Tools, Spare Parts, and Extra Stock Materials: Deliver as required, tools, spare parts, extra stocks of materials, and similar physical items.
- C. Locks and Keys: Make final change-over of locks and transmit keys to Owner, and advise to change-over in security provision.
- D. Testing of Systems: Complete start-up testing of systems, and instruction of operating/maintenance personnel.
- E. Temporary Facilities and Services: Discontinue (or change over) and remove from the Project site temporary facilities and services, along with construction tools and facilities, mock-ups, and similar elements.
- F. Final Cleaning: Complete the final cleaning.

- G. Exposed Finish Surfaces: Touch-up, repair, and restore marred exposed finishes.
- H. Meter Readings for Temporary Utilities: Submit final meter readings for temporary utilities, measured record of stored fuel, and similar data as of the time of substantial completion or when Owner took possession of, and responsibility for, corresponding elements of the Work.
- I. Timers: General Contractor shall set all timers for proper times of operation as required by Owner.

1.03 RECORD DOCUMENT SUBMITTALS

- A. General: Specific requirements for record documents are indicated in individual sections of the Specifications. The general requirements are indicated in the General Conditions, with additional provisions indicated in Section 01 01 00 - General Scope of Work, and Specification Divisions as required for Mechanical and Electrical Work, respectively. DO NOT USE record documents for construction purposes; protect from deterioration and loss in a secure fire-resistive location.
- B. Record Drawings:
 1. Contractors shall keep an accurate record of "As-Built" conditions as the Work progresses. Mark-up Drawings to indicate variance, at the time the variance occurs.
 2. Maintain a white print set (blue line or black line) of complete Construction Documents and Shop Drawings, in clean undamaged condition, for the purpose of checking and recording all installations which vary substantially from the Work as originally shown. The records shall include changes in sizes, locations, and dimensions, as well as any resulting from Bulletins, Change Orders, or Field Orders.
 3. Mark whichever Drawing is most capable of showing the "As-Built" condition fully and accurately; however, where Shop Drawings are used for mark-up, record a cross-reference at the corresponding location on the Contract Drawings.
 4. Mark with red erasable pencil and, where feasible, use other colors to distinguish between variations of separate categories of Work.
 5. Mechanical and Electrical Contractors shall give particular attention to concealed Work, and record all concealed mechanical and electrical services by color code. Record shall include exact locations of pipe, conduit, wire and cable, valves and all underground or otherwise concealed Mechanical and Electrical Work, properly dimensioned from adjacent building walls and with invert elevations noted. Record shall include all principal dimensions of concealed Work and any special notations such as valve numbers.
 6. Obtain a complete set of reproducibles using the Architect's original tracings and any Shop Drawings used for Record Drawings. Transfer all corrections, changes, and revisions from the job record set to the reproducibles and add to the legend "Record Drawings" and the date of printing to each reproducible. Within thirty (30) days of completion of job, print one (1) complete set of blacklines or blueprints. The reproducibles and blacklines or blueprints shall become the property of the Owner.
 7. Organize Record Drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.
- C. Photographic Documentation: Contractor shall submit a CD-ROM with all Project photos to the Owner within thirty (30) days of substantial completion to be retained by the Owner for his record and use. Organize the digital images by date the photographs were taken.

D. Maintenance Manuals:

1. Organize maintenance and operating manual information into individual binders properly identified, indexed, and thumb tabbed. Include names, addresses, telephone numbers, and e-mail addresses of equipment vendors and Subcontractors. Submit three (3) copy to the Owner within thirty (30) days of Substantial Completion to be retained by the Owner for his records and use.
2. Include information such as emergency instructions, spare parts listing, warranties and guarantees with name, telephone number and e-mail address of contact person, wiring diagrams, recommended "turn-around" cycles, inspection procedures, Shop Drawings, Product Data, names and addresses of each supplier, names and addresses of contractor and sub-contractors with contact person telephone number, e-mail address, and similar applicable information.
3. Bind each manual of each set in a heavy-duty, 3-ring, vinyl-covered binder (not less than 2" capacity), and include pocket folders for folded sheet information. Mark identification on the front and spine of each binder.

1.04 CLOSEOUT PROCEDURES

- A. General Operating/Maintenance Instructions: Arrange for each installer of Work requiring continuing maintenance or operation, to meet with personnel at the Project site to provide instructions needed for proper operation and maintenance of all equipment or components.
1. Include instructions by manufacturer's representatives where installers are not expert in the required procedures.
 2. Review maintenance manuals, record documentation, tools, spare parts and materials, lubricants, fuels, identification system, control sequences, hazards, cleaning and similar procedures and facilities.
 3. For operational equipment, demonstrate start-up, shut-down, emergency operations, noise and vibration adjustments, safety, economy/efficiency adjustments, and similar operations.
 4. Review maintenance and operations in relation with applicable guarantees, warranties, agreements to maintain, bonds, and similar continuing commitments.

1.05 FINAL CLEANING

- A. General: Provide cleaning for specific units of Work as specified within the Specifications Sections listed under the Table of Contents in the Project Manual. Provide final cleaning of the Work, at the time indicated, consisting of cleaning each surface or unit of Work to the normal "clean" condition expected for a first-class building cleaning and maintenance program. Comply with manufacturers' instructions for cleaning operations.
- B. Cleaning Requirements: The following are examples, but not by way of limitation, of the cleaning levels required, including removing all marks, stains, soil, and fingerprints from all completed Work.
1. Remove manufacturer's or contractor's labels which are not required as permanent. Remove protective coverings and tags, except for those required to demonstrate compliance with building codes, fire-ratings and testing. Also remove all residue and glue remaining on the surface.
 2. Clean transparent and reflective glass materials, including window/door glass and mirrors with ammonia-type, non-streaking glass cleaner, to a polished condition, removing substances which are noticeable as vision-obscuring materials. Replace broken or damaged glass and mirrors.

3. Clean exposed exterior and interior hard-surface finishes, including metals, concrete, painted surfaces, tile, and similar surfaces, to a dirt-free condition, free of dust, stains, films and similar noticeable distracting substances. Except as otherwise indicated; avoid the disturbance of natural weathering of exterior surfaces. Restore reflective surfaces to original reflective condition.
 4. Wipe surfaces of mechanical and electrical equipment clean, and remove excess lubrication and other foreign substances. Change filters within HVAC equipment.
 5. Remove debris and surface dust from limited-access spaces including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.
 6. Clean concrete floors in non-occupied spaces broom clean.
 7. Provide two (2) coats of wax on all vinyl floors.
 8. Vacuum clean soft material surfaces, such as carpeted and similar surfaces.
 9. Damp wipe and clean all fixtures, including light fixtures and lamps so as to function with full efficiency. Replace burned-out or broken lamps.
 10. Wash, clean, and polish as recommended by the manufacturer, all porcelain and/or ceramic tile surfaces.
 11. Remove and dispose of all trash, scraps, packing, and all other construction debris.
 12. Clean Project site (yard and grounds), including landscape, development areas, of litter and foreign substances. Sweep paved areas to a broom-clean condition; remove stains, petro-chemical spills and other foreign deposits. Rake grounds which are neither planted nor paved, to a smooth, even-textured surface.
- C. Damages: Any damage caused by Contractors with cleaning equipment shall be repaired or replaced by the Contractor responsible for the damage.
- D. Time of Final Cleaning: Following certification of "Substantial Completion".

1.06 PEST CONTROL

- A. Engage an experienced exterminator to make a final inspection of the Project, and to eliminate the Project of rodents, insects, and other pests. Comply with governing regulations and applicable health and safety standards.

1.07 REMOVAL OF PROTECTION

- A. Except as otherwise indicated or requested, remove temporary protection devices and facilities which were installed during the course of the Work to protect previously completed Work during the remainder of the construction period.

1.08 COMPLIANCES

- A. Comply with safety standards and governing regulations for cleaning operations. Do not burn waste materials at the site, or bury debris or excess materials on the Owner's property, or discharge volatile or other harmful or dangerous materials into drainage systems; remove waste materials from the site and dispose of in a lawful manner. At no time during or at completion of construction, place any excess material, into Owner's compactor or container.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 02 32 00SOIL INVESTIGATION REPORTS

A Geotechnical Investigation Report is included herein for use by the Bidder. Soil borings, laboratory testing, and recommendations contained with the Report are designed to incorporate a unique set of Project specific factors, and do not represent actual conditions in areas not sampled. Extrapolation of data by geotechnical engineers is used to produce an opinion about overall subsurface conditions, the reaction to proposed construction activity, and appropriate foundation design. Actual conditions may differ from those inferred to exist, and actual conditions in areas not sampled may differ from predictions.

Report of Geotechnical Engineering Investigation
Truck Terminal – R&L Carriers
250 East 800 North
Edinburgh, Indiana
Patriot Project No.: 20-0986-01G

Prepared For:

Neil Mullins
R&L Carriers
600 Gilman Road
Wilmington, Ohio

Prepared By:

Patriot Engineering and Environmental, Inc.
6150 East 75th Street
Indianapolis, Indiana 46250

September 9, 2020



**PATRIOT ENGINEERING
and ENVIRONMENTAL, Inc.**

Engineering Value for Project Success

September 9, 2020

Mr. Neil Mullins
R&L Carriers
600 Gilman Road
Wilmington, Ohio 45177

Re: Report of Geotechnical Engineering Investigation
Truck Terminal – R&L Carriers
250 East 800 North
Edinburgh, Indiana
Patriot Project No.: 20-0986-01G

Dear Neil:

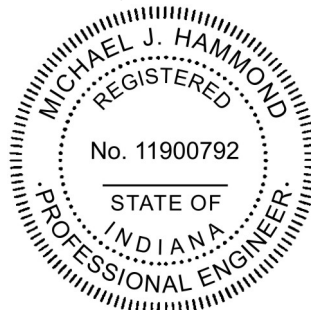
Attached is the report of our subsurface investigation for the above referenced project. This investigation was completed in general accordance with our Proposal No. P20-1119-01G dated August 3, 2020.

This report includes detailed and graphic logs of nineteen (19) soil borings drilled at the proposed project site. Also included in the report are the results of laboratory tests performed on samples obtained from the site, and geotechnical recommendations pertinent to the site development, foundation design, and construction.

We appreciate the opportunity to perform this geotechnical engineering investigation and are looking forward to working with you during the construction phase of the project. If you have any questions regarding this report or if we may be of any additional assistance regarding any geotechnical aspect of the project, please do not hesitate to contact our office.

Respectfully submitted,
Patriot Engineering and Environmental, Inc.

Logan Young, E.I.
Geotechnical Engineer



Michael Hammond, P.E.
Project Engineer

Table of Contents

1.0 INTRODUCTION	1
1.1 General	1
1.2 Purpose and Scope	1
2.0 PROJECT INFORMATION	1
3.0 SITE AND SUBSURFACE CONDITIONS	2
3.1 Site Conditions	2
3.2 General Subsurface Conditions	2
3.3 Groundwater Conditions	4
3.4 Field Infiltration Testing	4
4.0 DESIGN RECOMMENDATIONS	4
4.1 Basis	4
4.2 Foundations	5
4.2.1 Geopier Rammed Aggregate Piers	5
4.2.2 Undercutting Unsuitable Soils and Replacement with Structural Fills....	6
4.2.3 General Foundation Recommendations	7
4.3 Floor Slabs	7
4.4 Seismic Considerations	8
4.5 Pavements	9
4.6 Storm-Water Management Basin	11
5.0 CONSTRUCTION CONSIDERATIONS	12
5.1 Site Preparation	12
5.2 Foundation Excavations	13
5.3 Structural Fill and Fill Placement Control	14
5.4 Groundwater Considerations	15
6.0 INVESTIGATIONAL PROCEDURES	15
6.1 Field Work	15
6.2 Laboratory Testing	16
7.0 ILLUSTRATIONS	16

APPENDICES

Appendix A:	Site Vicinity Map (Figure No. 1)
	Boring Location Map (Figure No. 2)
	Boring Logs
	Boring Log Key
	Unified Soil Classification System (USCS)
Appendix B:	Seismic Site Class Evaluation
Appendix C:	Pavement Design Evaluation and Design Sections
Appendix D:	General Qualifications
	Standard Clause for Unanticipated Subsurface Conditions

REPORT OF GEOTECHNICAL ENGINEERING INVESTIGATION

**Truck Terminal – R&L Carriers
250 East 800 North
Edinburgh, Indiana
Patriot Project No.: 20-0986-01G**

1.0 INTRODUCTION

1.1 General

R&L Carriers is planning the construction of a new truck terminal to be located near 250 East 800 North in Edinburgh, Indiana. The results of our geotechnical engineering investigation for the project are presented in this report.

1.2 Purpose and Scope

The purpose of this investigation is to determine the general near surface and subsurface conditions within the project area and to develop the geotechnical engineering recommendations necessary for the design and construction of the proposed truck terminal. This was achieved by drilling soil borings, and by conducting laboratory tests on samples taken from the borings. This report contains the results of our findings, an engineering interpretation of these results with respect to the available project information, and recommendations to aid in the design and construction of the proposed facility.

2.0 PROJECT INFORMATION

The proposed project is located near 250 East 800 North in Edinburgh, Indiana. The project consists of a truck terminal with a pre-engineered metal building. The structures will be slab on grade. The passenger vehicle parking lot will consist of 183 car parking spaces. The truck terminal is 986 feet long with 153 dock plates and a 5,000 square foot office attached. There is a tractor parking lot with 168 parking spaces on the southwestern corner of the building pad. There will be detention basins located south of the proposed structure. The building pad location will need to be raised using the excavated soil from the detention ponds.

No structural loading information was provided to us at the time of this report. We assume that the proposed structure will have wall loads not exceeding 3,000 pounds per lineal feet (plf), isolated column loads not exceeding 120 kips, and that floor loads will not exceed 150 pounds per square foot (psf). Additionally, based on visual observations of the existing site, it is assumed that any grade raise fill to complete the construction of building pads,

finished pavement subgrades, etc., will not exceed 5 feet above the existing ground surface.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Site Conditions

The project site is presently an approximately 75-acre parcel used for agricultural purposes. The surrounding area is generally an area of commercial and agricultural development. The topography in the area proposed for construction is generally flat, with a gentle slope rising to the west.

3.2 General Subsurface Conditions

Our interpretation of the subsurface conditions is based upon nineteen (19) soil borings drilled at the approximate locations shown on the Boring Location Map (Figure No. 2) in Appendix "A". All depths discussed below refer to depths below the existing ground surface. Based on the results of the soil borings completed at the site, the following subsurface profile is presented. A description of each general soil unit has been identified and is described below:

Topsoil – Topsoil, a surficial layer of material that is a blend of silts, sands, and clays, with varying amounts of organic matter, was encountered at the ground surface at the nineteen (19) boring locations. The topsoil layer was about 12 inches thick in the borings. ***Please note since the project site is utilized as farmland, we anticipate that the thickness of the topsoil in the cultivated areas could be thicker than noted at the borings.***

Silty Clay (CL) - The topsoil layer is generally underlain slightly moist to moist, soft to stiff, silty clay. The silty clay layers typically extend to depths of 2.0 to 8.5 feet below the existing ground surface when encountered. The natural moisture content of this material ranges from 14 to 24 percent (%). The silty clay layers have unconfined compressive strengths, as determined by a hand penetrometer, of 1.75 to greater than 4.5 tons per square foot (tsf). Standard Penetration Test N-values (blow counts) in this material varied from 4 to 15 blows per foot (bpf). ***Please note soft clays were encountered at four (4) borings (B-5, B-7, IT-4 and IT-5) at a depth range of 1-8.5 feet (Refer Table 1 and boring logs).***

Sand (SP-SM) – Below the silty clay layers or the topsoil layer, slightly moist to saturated, very loose to medium dense, sand was encountered to the termination of the borings

(approximately 10 to 25 feet) below existing grade at nineteen (19) boring locations. Standard Penetration Test N-values in this sand varied from 0 to 32 bpf. **Very loose sand was encountered in ten (10) of the nineteen (19) borings. Please see Table No. 1 for locations of the very loose sand.**

As previously mentioned, unsuitable very soft to soft clays and very loose sands were encountered in thirteen (13) of the nineteen (19) borings, at depths between 1 to 23.5 feet. The following table presents the extent of the unsuitable soils encountered in the borings:

Table No. 1: Summary of Unsuitable Soils Encountered in Borings

Boring Number	Soil Classification	Approximate Depth of Unsuitable Soils (feet) ⁽¹⁾
B-2	Very Loose Sand (SP-SM)	3.5 to 6
B-3	Very Loose Sand (SP-SM)	3.5 to 8.5
B-4	Very Loose Sand (SP-SM)	3.5 to 13.5
B-5	Soft Silty Clay (CL)	1 to 6
B-6	Very Loose Sand (SP-SM)	3.5 to 6
B-7	Soft Silty Clay (CL)	1 to 3.5
	Soft Silty Clay (CL)	6 to 8.5
	Very Loose Sand (SP-SM)	8.5 to 13.5
B-8	Very Loose Sand (SP-SM)	6 to 13.5
B-10	Very Loose Sand (SP-SM)	3.5 to 6
	Very Loose Sand (SP-SM)	18.5 to 23.5
IT-1	Very Loose Sand (SP-SM)	6 to 13.5
IT-2	Very Loose Sand (SP-SM)	3.5 to 6
IT-3	Very Loose Sand (SP-SM)	1 to 3.5
IT-4	Soft Silty Clay	3.5 to 6
IT-5	Soft Silty Clay	3.5 to 8.5

(1) Represents depth below existing ground surface.

The soil conditions described above are general, and some variations in the descriptions should be expected; for more specific information, please refer to the boring logs presented in Appendix "A". It should be noted that the dashed stratification lines shown on

the soil boring logs indicate approximate transitions between soil types. In-situ stratification changes could occur gradually or at different depths.

3.3 Groundwater Conditions

The term groundwater pertains to any water that percolates through the soil found on site. This includes any overland flow that permeates through a given depth of soil, perched water, and water that occurs below the “water table”, a zone that remains saturated and water-bearing year-round.

Groundwater was observed during drilling in fourteen (14) of the nineteen (19) soil borings performed at the site at depths of 13.5 to 19 feet below the existing ground surface. Groundwater was not observed in the remaining borings during drilling. Immediately after the borings were completed and the augers were removed from the boreholes, the soil borings were dry at the cave-in depths.

It should be recognized that fluctuations in the groundwater level should be expected over time due to variations in rainfall and other environmental or physical factors. ***The true static groundwater level can only be determined through observations made in cased holes over a long period of time, the installation of which was beyond the scope of this investigation.***

3.4 Field Infiltration Testing

Per the Client’s request, we performed infiltration tests at a depth of approximately 5 to 10 feet below the existing ground surface at soil borings IT-1, IT-2, IT-3, IT-4, IT-5, IT-6, and IT-7. The infiltration testing was requested to determine infiltration characteristics of soils within the proposed basin areas. The soils encountered in these soil borings at the specified depths were between very loose to medium dense sand (SP-SM). Due to the dry conditions and the high permeability of the sand, the sands were not able to be saturated during the tests. Based on our experience, an infiltration rate of 0.5 to 2 inches per hour can be used for the sands encountered at the site.

4.0 DESIGN RECOMMENDATIONS

4.1 Basis

Our recommendations are based on data presented in this report, which include soil borings, laboratory testing, and our experience with similar projects. Subsurface variations

that may not be indicated by a dispersive exploratory boring program can exist on any site. If such variations or unexpected conditions are encountered during construction, or if the project information is incorrect or changed, we should be informed immediately since the validity of our recommendations may be affected.

4.2 Foundations

B-1 through B-7 were drilled in the truck terminal's dock plates. As previously mentioned, very loose sand was generally encountered in thirteen (13) of the nineteen (19) soil borings extending to depth of 3.5 to 23.5 feet below existing grade (**Refer to Table No. 1 and Boring Logs**). ***If encountered during construction, these soft clays and very loose sands are unsuitable for supporting foundations, and therefore must be undercut and replaced with well-compacted structural fill or improved in-place prior to construction of footings.*** Since thirteen (13) out of the nineteen (19) borings encountered these unsuitable materials, extensive undercutting should be anticipated. Therefore, we believe that a ground improvement system such as Geopiers® Rammed Aggregate Piers may be an alternative option for the project structures. In addition, undercutting of unsuitable soils and replacement with compacted new structural fills can also be considered if the client wishes. These foundation recommendations are discussed below.

4.2.1 Geopier Rammed Aggregate Piers

Based on the soil conditions at this site, a properly installed Geopier Rammed Aggregate Piers™ (open hole with compacted crushed stone layers) system could be the economical option to support the project structure. This option will minimize potential deeper undercuts during construction. The Geopier Foundation System not only allows for the use of a shallow spread footing foundation using conventional construction methods, but also allows for some improvement of the soils within the project area due to the construction methods involved in placing the Geopiers.

Rammed Aggregate Piers are constructed by drilling 24 to 30-inch diameter holes within the shallow foundation footprint, and then backfilling the holes with compacted crushed stone to form a dense aggregate pier. The footings are then constructed directly on the Geopier reinforced subgrade using conventional construction methods. The Geopier Foundation Company retains the responsibility for the final pier designs. Geopier can provide estimated foundation settlements along with warranting the performance of the footings supported by Geopier elements.

Patriot recommends that the Geopiers should be installed and extended adequately into suitable sands encountered in the soil borings. Additionally, we recommend that *Patriot* be retained to observe the installation process. Although the Geopier Foundation Company warrants the performance of their work, it is their standard practice to have quality assurance during installation of the Geopiers.

Based on our past experience with similar projects, it is estimated that by reinforcing the weaker fill layers with Geopier foundation elements, an allowable soil bearing pressure on the order of 3,000 to 5,000 pounds per square foot (psf) could be utilized for the design of the spread footing foundations. ***However, the actual allowable bearing capacity and estimated settlements can only be determined by the Geopier Foundation Company. Our estimates should only be considered as a guide for preliminary design.***

4.2.2 Undercutting Unsuitable Soils and Replacement with Structural Fills

If soft clays, very loose sands or other unsuitable materials are encountered at the footing level or below, they must be undercut and replaced with well-compacted structural fill or improved in-place prior to construction of foundations or the footings can be extended to suitable natural soils. Following the excavation of the footing areas, the foundations subgrade should be visually inspected by a *Patriot* representative and probed at multiple locations at isolated footings and at every 10 feet (maximum) along wall footings using a Dynamic Cone Penetrometer (DCP) to a minimum depth of 5 feet below the footing subgrade to verify that the underlying soil has a SPT blow count of 7 or more or unconfined compressive strength of 1.0 tsf or more. Any unsuitable soils encountered at the footing subgrade or below should be removed and replaced with well-compacted structural fill.

Provided the above recommendations are followed, the proposed structures can be supported on spread footings bearing on the medium stiff silty clays or loose to medium dense sands encountered at shallow depths or on new well-compacted structural fill overlying the same. These footings should be proportioned using a net allowable soil bearing pressure not exceeding 2,000 pounds per square foot (psf) for column footings or 1,500 psf for wall (strip) footings. For proper performance at the recommended design bearing pressure, foundations must be constructed in compliance with the recommendations for footing excavation inspection that are discussed in Section 5.0 “Construction Considerations”.

We estimate that the total foundation settlement should not exceed approximately 1 inch and that differential settlement should not exceed about $\frac{3}{4}$ inch. Careful field control during construction is necessary to minimize the actual settlement that will occur.

4.2.3 General Foundation Recommendations

In using the above net allowable soil bearing pressures, the weight of the foundation and backfill over the foundation need not be considered. Hence, only loads applied at or above the minimum finished grade adjacent to the footing need to be used for dimensioning the foundations. Each new foundation should be positioned so it does not induce significant pressure on adjacent foundations; otherwise the stress overlap must be considered in the design.

All exterior foundations and foundations in unheated areas should be located at a depth of at least 30 inches below final exterior grade for frost protection. However, interior foundations in heated areas can bear at depths of approximately 24 inches below the finished floor. We recommend that wall (strip) footings be at least 18 inches wide and column footings be at least 24 inches wide for bearing capacity considerations.

Positive drainage of surface water, including downspout discharge, should be maintained away from structure foundations to avoid wetting and weakening of the foundation soils both during construction and after construction is complete.

4.3 Floor Slabs

The near surface or shallow subgrade soils encountered within the proposed building footprints generally consist of medium stiff to stiff silty clays, which if properly prepared are suitable for floor slab support. ***However, depending on the proposed site grading, soft or very loose materials may be encountered at or near the proposed slab level or grade raise fill may be placed prior to construction of the floor slabs. Therefore the soft compressive layers should be undercut prior to placement of fills or the floor slab subgrade could be improved using a rammed aggregate pier system similarly used for foundations.***

We recommend that all floor slabs be designed as "floating", that is, fully ground supported and not structurally connected to walls or foundations. This is to minimize the possibility of cracking and displacement of the floor slabs because of differential movements between the slab and the foundation. Although the movements are estimated to be within the tolerable limits for the structural safety, such movements could be detrimental to the slabs

if they were rigidly connected to the foundations. Additionally, we recommend that all slabs should be liberally jointed and designed with the appropriate reinforcement for the anticipated loading conditions.

The building floor slabs should be supported on a minimum 6 inch thick well-compacted granular base course (i.e. Indiana Department of Transportation (INDOT) No. 53 crushed stone) bearing on a suitably prepared subgrade (Refer to Section 5.0 “*Construction Considerations*”). The granular base course is expected to help distribute loads and equalize moisture conditions beneath the slab.

Provided that the recommendations above for floor slab design and construction are followed, a modulus of subgrade reaction, “K₃₀” value of 75 pounds per cubic inch (pci), is recommended for the design of ground supported floor slabs. It should be noted that the “K₃₀” modulus is based on a 30 inch diameter plate load empirical relationship.

4.4 Seismic Considerations

For structural design purposes, we recommend using a **Site Classification of “D”** as defined by the 2014 Indiana Building Code (modified 2012 International Building Code (IBC)). Furthermore, along with using a Site Classification of D, we recommend the use of the maximum considered spectral response acceleration and design spectral response acceleration coefficients provided in Table No. 2 below. Refer to Appendix “B” for “*Seismic Site Class Evaluation*” report summary.

Table No. 2: Seismic Design Spectral Response Acceleration Coefficients

Period (seconds)	Maximum Considered Spectral Response Acceleration Coefficient	Soil Factor	Design Spectral Response Acceleration Coefficient
0.2	$S_s = 0.171 \text{ g}$	1.6	$S_{DS} = 0.182 \text{ g}$
1.0	$S_1 = 0.092 \text{ g}$	2.4	$S_{D1} = 0.146 \text{ g}$

These values were obtained from the “*Earthquake Ground Motion Parameters*” program for seismic design, developed by the United States Geological Survey (USGS) Earthquake Hazard Program, utilizing latitude 39.3224° north and longitude 85.9666°

west as the designation for identifying the location of the parcel. Other earthquake resistant design parameters should be applied consistent with the minimum requirements of the 2014 Indiana Building Code.

4.5 Pavements

The near surface or shallow subgrade soils encountered within the proposed pavement areas generally consist of medium stiff to stiff silty clays or loose to medium dense sands, which if properly prepared are suitable for pavement support. ***However, soft clays and very loose sands were encountered at or near existing ground surface at some of the boring locations. If encountered during construction or if grade raise fills are planned for these areas, the soft and very loose unsuitable soils should be undercut and replaced with well compacted structural fill prior to construction of pavements or placement of grade raise fills.***

If construction is performed during a wet or cold period, the contractor will need to exercise care during the grading and fill placement activities in order to achieve the necessary subgrade soil support for the pavement section (Refer to Section 5.0 “Construction Considerations”). The base soil for the pavement section will need to be firm and dry. The subgrade should be sloped properly in order to provide good base drainage. To minimize the effects of groundwater or surface water conditions, the base section for the pavement system should be sufficiently high above adjacent ditches and properly graded to provide pavement surface and pavement base drainage.

As requested, *Patriot* is providing minimum design recommendations for a light-duty flexible (asphalt) pavement section and a heavy-duty rigid (concrete) pavement section. These design recommendations have been evaluated and based on the estimated design criteria provided below, along with our evaluation of the subsurface conditions. Our recommended minimum pavement design sections provided below are based on a soil support evaluation performed in accordance with generally accepted procedures set forth by the American Association of State Highway and Transportation Officials (AASHTO) “*Guide for Design of Pavement Structures, 1993*”. ***The Client has provided required traffic loading for the passenger vehicles and tuck traffic. The pavement design is based on the required specifications and the following design assumptions:***

- Design Life of 20 years
- Traffic Loading Conditions:
 - Light-Duty Traffic Loading Passenger Vehicles (400 per day)
 - Heavy-Duty Traffic Loading Semi-trucks (280 per day)

- 18-kips Equivalent Single Axle Loading (ESAL) estimated design value:
 - Light-Duty Traffic Loading Flexible Pavement = 50,000
 - Heavy-Duty Traffic Loading Rigid Pavement = 16,800,000
- Initial Serviceability:
 - Flexible Pavement = 4.2
 - Rigid Pavement = 4.5
- Terminal Serviceability of 2.0 (for both flexible pavement)
- Reliability of 80 percent (%) (for both flexible and rigid pavement)
- Standard Deviation
 - Flexible Pavement = 0.45
 - Rigid Pavement = 0.35
- Estimated California Bearing Ratio (CBR) of 2.5 (or MR = 3,750 psi)
- Estimated Subgrade Modulus of Subgrade Reaction value of 75 pounds per cubic inch (pci)
- The crushed stone base course will not contain more than 10 percent (%) fines and will be compacted to at least 100 percent (%) of the maximum Standard Proctor dry density.
- Asphalt will be placed and compacted in accordance with the INDOT 2016 Standard Specification Requirements.
- Periodic Maintenance: We recommend that cracking should be filled and sealed according to INDOT Standard Specification Section 408 periodically after the installation of the pavement. Inspection can also be performed at these times for any isolated areas of excessive fatigue cracking, which could necessitate full-depth patching. Underdrain outlets shall be inspected annually to ensure that there are no man-made or natural obstructions to the flow.

Based on the above design parameters, provided below are the calculated minimum pavement design thicknesses for a flexible (asphalt) pavement section.

**Table No. 1: Flexible Pavement Design (Minimum Thicknesses)
(Light-Duty - For Passenger Vehicle Parking Lot Only)**

Traffic Loading Conditions⁽¹⁾	Asphalt Surface Course HMA 9.5 mm (Inches)⁽²⁾	Asphalt Base Course HMA 19 mm (Inches)⁽²⁾	Aggregate Sub-Base (Inches)⁽³⁾	Design Life (Years)
50,000 ESAL's	1.5	3.5	6	20

⁽¹⁾ Estimated ESAL based on estimated number of truck passes per day

⁽²⁾ Indiana Department of Transportation (INDOT) Specified Hot Mix Asphalt (HMA)

⁽³⁾ Indiana Department of Transportation (INDOT) No. 53 Crushed Stone, containing no more than 10 percent (%) fines.

**Table No. 2: Rigid Pavement Design (Minimum Thicknesses)
(Heavy-Duty – Truck Terminal Pavements)**

Traffic Loading Conditions ⁽¹⁾	Concrete Surface Course (Inches) ⁽²⁾	Aggregate Sub-Base Course INDOT No. 53 (Inches) ⁽³⁾	Effective Modulus of Subgrade Reaction (k-value) ⁽⁴⁾
16,800,000 ESAL's	11	8	75 pci

(1) Estimated ESAL based on estimated number of truck passes per day

(2) Minimum of 4,000 pounds per square inch (psi) concrete strength.

(3) The aggregate base course should contain no more than 10 percent (%) fines.

(4) AASHTO Guide for Design of Pavement Structures 1993.

4.6 Storm-Water Management Basin

The soils encountered in the area of the proposed storm-water management basin (Borings IT-1, IT-2, IT-3, IT-4, IT-5, IT-6, and IT-7) consist of silty clays which extend to depths between 3.5 and 8.5 feet below the existing ground surface. The silty clays are underlaid by sands that extend to the termination of the soil borings. The clays are considered relatively favorable for a retention basin, due to the estimated moderate permeability characteristics of the clays. However, the sand layers generally encountered underlying the clays would not be favorable for retention of storm-water, as the sand layers are estimated to have relatively high permeability characteristics. In addition, based on our experience, pockets and layers of sands are anticipated within the clay layer. Therefore, if a retention capacity is required for the detention pond, the pond will require the installation of a clay liner, and/or a synthetic liner. However, if percolation of water into the underlying soil is allowed and maintaining a long-term pond level is not a concern, a liner may not be required.

The soils encountered in our borings should be readily excavated using conventional earthwork equipment. ***Additionally, depending on the invert elevation of the proposed detention basin, sand layers and seams could be encountered which are expected to be free-flowing and will tend to readily cave and/or slough into excavations; therefore, over-excavation, benching and/or shoring should be expected in order to maintain the side slopes of the excavations.***

Depending on seasonal conditions and the invert elevation of the proposed detention basin, localized and sporadic groundwater infiltration should be expected to be encountered in the detention basin excavation. Furthermore, it should also be noted that there may be the potential for encountering heaving of sand layers near the groundwater elevations during construction.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Site Preparation

All areas that will support foundations, floors, pavements, or newly placed structural fill must be properly prepared. All loose surficial soil or “topsoil” and other unsuitable materials must be removed. Unsuitable materials include: frozen soil, relatively soft material, relatively wet soils, deleterious material, or soils that exhibit a high organic content.

Approximately 12 inches of loose surficial topsoil was encountered in the borings. The topsoil was measured at discrete locations as shown on the Boring Location Map (Figure No. 2) in Appendix “A”. The topsoil thickness measured at the boring locations may or may not be representative of the overall average topsoil thickness at the site. Thicker layers of material may be found in areas due to the use of the property for agricultural cultivation. Therefore, it is possible that the actual stripping depth could significantly vary from this data. The data presented should be viewed only as a guide to the minimum stripping depth that will be required to remove organic material at the surface. Additional field exploration by *Patriot* would be required to provide an accurate estimate of the stripping depth. This limited data indicates that a minimum stripping depth will be required to remove the organic material at the surface, followed by the potential for additional stripping and/or scarification and recompaction as may be required to achieve suitable subgrade support. ***Additionally, if saturated conditions exist with the surface soils, light tracked equipment could be required to avoid pushing organics deeper into the suitable subgrade soils.*** A *Patriot* representative should verify the stripping depth at the time grading operations occur.

Prior to construction of floor slabs, pavements or the placement of new structural fill, the exposed subgrade must be evaluated by a Patriot representative; which will include proofrolling of the subgrade. Proofrolling should consist of repeated passes of a loaded, pneumatic-tired vehicle such as a tandem-axle dump-truck or scraper. The proofrolling operations should be observed by a *Patriot* representative, and the proofrolling vehicle should be loaded as directed by *Patriot*. Any area found to rut, pump, or deflect excessively should be compacted in-place or, if necessary, undercut and replaced with structural fill, compacted as specified in Section 5.3 “*Structural Fill and Fill Placement Control*”.

Care must be exercised during grading and fill placement operations. ***The combination of heavy construction equipment traffic and excess surface moisture can cause pumping and deterioration of the near surface soils. The severity of this potential***

problem depends to a great extent on the weather conditions prevailing during construction. The contractor must exercise discretion when selecting equipment sizes and also make a concerted effort to control construction traffic and surface water while the subgrade soils are exposed. We recommend that heavy construction equipment (i.e. dump trucks, scrapers, etc.) be rerouted away from the building and pavement areas. If such problems do arise, the operations in the affected area should be halted and the *Patriot* representative contacted to evaluate the condition.

5.2 Foundation Excavations

Excavation will be performed on sandy soils that can be easily disturbed. If the subgrade soil is disturbed, it should be re-compacted or a crushed stone layer should be placed at the subgrade level.

Upon completion of the foundation excavations and prior to the placement of reinforcing steel, a *Patriot* representative should check the exposed subgrade to confirm that a bearing surface of adequate strength has been reached. Any localized soft soil zones encountered at the bearing elevations should be further excavated until adequate support soils are encountered. The cavity should be backfilled with structural fill as defined below, or the footing can be poured at the excavated depth. Structural fill used as backfill beneath footings should be limited to lean concrete, well-graded sand and gravel, or crushed stone placed and compacted in accordance with Section 5.3 “*Structural Fill and Fill Placement Control*”.

If it is necessary to support spread footings on structural fill, the fill pad must extend laterally a minimum distance beyond the edge of the footing. The minimum structural pad width would correspond with a point at which an imaginary line extending downward from the outside edge of the footing at a 1H:2V (horizontal: vertical) slope intersects the surface of the natural soils. For example, if the depth to the bottom of excavation is 4 feet below the bottom of the foundation, the excavation would need to extend laterally beyond the edge of the footing at least 2 feet, as shown in Illustration “A” found at the conclusion of this report.

Excavation slopes should be maintained within all requirements set-forth by the Occupational Safety and Health Standards (OSHA), but specifically Section 1926 Subpart “P” – “*Excavations*”. We recommend that any surcharge fill or heavy equipment be kept at least 5 feet away from the edge of the excavation.

Construction traffic on the exposed surface of the bearing soil will potentially cause some disturbance of the subgrade and consequently loss of bearing capacity. However, the degree of disturbance can be minimized by proper protection of the exposed surface.

5.3 Structural Fill and Fill Placement Control

Structural fill, defined as any fill which will support structural loads, should be clean and free of organic material, debris, deleterious materials and frozen soils. Samples of the proposed fill materials should be tested prior to initiating the earthwork and backfilling operations to determine the classification, the natural and optimum moisture contents and maximum dry density and overall suitability as a structural fill. ***Structural fill should have a liquid limit less than 40 and a plasticity index less than 20.***

All structural fill beneath floor slabs, adjacent to foundations and over foundations, should be compacted to at least 95 percent (%) of its maximum Standard Proctor dry density (ASTM D-698). This minimum compaction requirement should be increased to 100 percent (%) of the maximum Standard Proctor dry density for fill supporting footings, provided these are designed as outlined Section 4.0 “*Design Recommendations*”.

Structural fill supporting, around and over utilities should be compacted to at least 95 percent (%) of its maximum Standard Proctor dry density (ASTM D-698) for utilities underlying structural areas (i.e. buildings, pavements, sidewalks, etc.). However, the minimum compaction requirement can be reduced for backfill around and over the utilities to 90 percent (%) of the maximum Standard Proctor dry density where utilities underlie greenbelt areas (i.e. grassy lawns, landscaping, etc.). It is recommended that a clean well-graded granular material be utilized as the bedding material, as well as the backfill material around and over the utility lines.

In cut areas, where pavement sections are planned, the upper 10 inches of subgrade should be scarified and compacted to a dry density of at least 100 percent (%) of the Standard Proctor maximum dry density (ASTM D-698). Any grade-raise fill placed within 1 foot of the base of the pavement section should also be compacted to at least 100 percent (%) of the Standard Proctor maximum dry density. This can be reduced to 95 percent (%) for structural fill placed more than 1 foot below the base of the pavement section.

To achieve the recommended compaction of the structural fill, we suggest that the fill be placed and compacted in layers not exceeding 8 inches in loose thickness (the loose lift thickness should be reduced to 6 inches when utilizing small hand compactors) and within the range of 2 percentage (%) points below or above the optimum moisture content value. All fill placement should be monitored by a *Patriot* representative. ***Each lift should be tested for proper compaction at a frequency of at least one (1) test every 2,500 square feet (ft²) per lift for the building areas, at least one (1) test every 10,000 square feet (ft²) per lift for the parking and roadway areas, and at a frequency of at least one (1) test for every 50 lineal feet of utility installation.***

5.4 Groundwater Considerations

Groundwater was observed during our field activities at depths between about 13.5 to 19 feet below the existing ground surface; which is expected to be below the anticipated foundation excavation depths. However, depending on seasonal conditions, localized or sporadic groundwater infiltration may occur into the excavations.

Groundwater inflow into shallow excavations **above** the groundwater table is expected to be adequately controlled by conventional methods such as gravity drainage and/or pumping from sumps. More significant inflow can be expected in deeper excavations **below** the groundwater table requiring more aggressive dewatering techniques, such as well or wellpoint systems. For groundwater to have minimal effects on the construction, foundation excavations should be constructed and poured in the same day, if possible.

6.0 INVESTIGATIONAL PROCEDURES

6.1 Field Work

A total of nineteen (19) soil borings were drilled, sampled, and tested at the project site between August 17 and 20, 2020 at the approximate locations shown on the Boring Location Map (Figure No. 2) in Appendix “A”. The depths that the soil borings were advanced to are shown on the Boring Logs in Appendix “A”.

The borings were advanced using 3¼ inch inside diameter hollow-stem augers. Samples were recovered in the undisturbed material below the bottom of the augers using the standard drive sample technique in accordance with ASTM D 1586-74. A 2 inch outside diameter by 1⅜ inch inside diameter split-spoon sampler was driven a total of 18 inches with the number of blows of a 140 pound hammer falling 30 inches recorded for each 6 inches of penetration. The sum of blows for the final 12 inches of penetration is the

Standard Penetration Test result commonly referred to as the N-value (or blow-count). Split-spoon samples were recovered at 2.5 feet intervals, beginning at a depth of 1 foot below the existing surface grade, extending to a depth of 10 feet, and at 5 feet intervals thereafter to the termination of the boring.

Water levels were monitored at each borehole location during drilling and upon completion of the boring. The boreholes were backfilled with auger cuttings prior to demobilization for safety considerations.

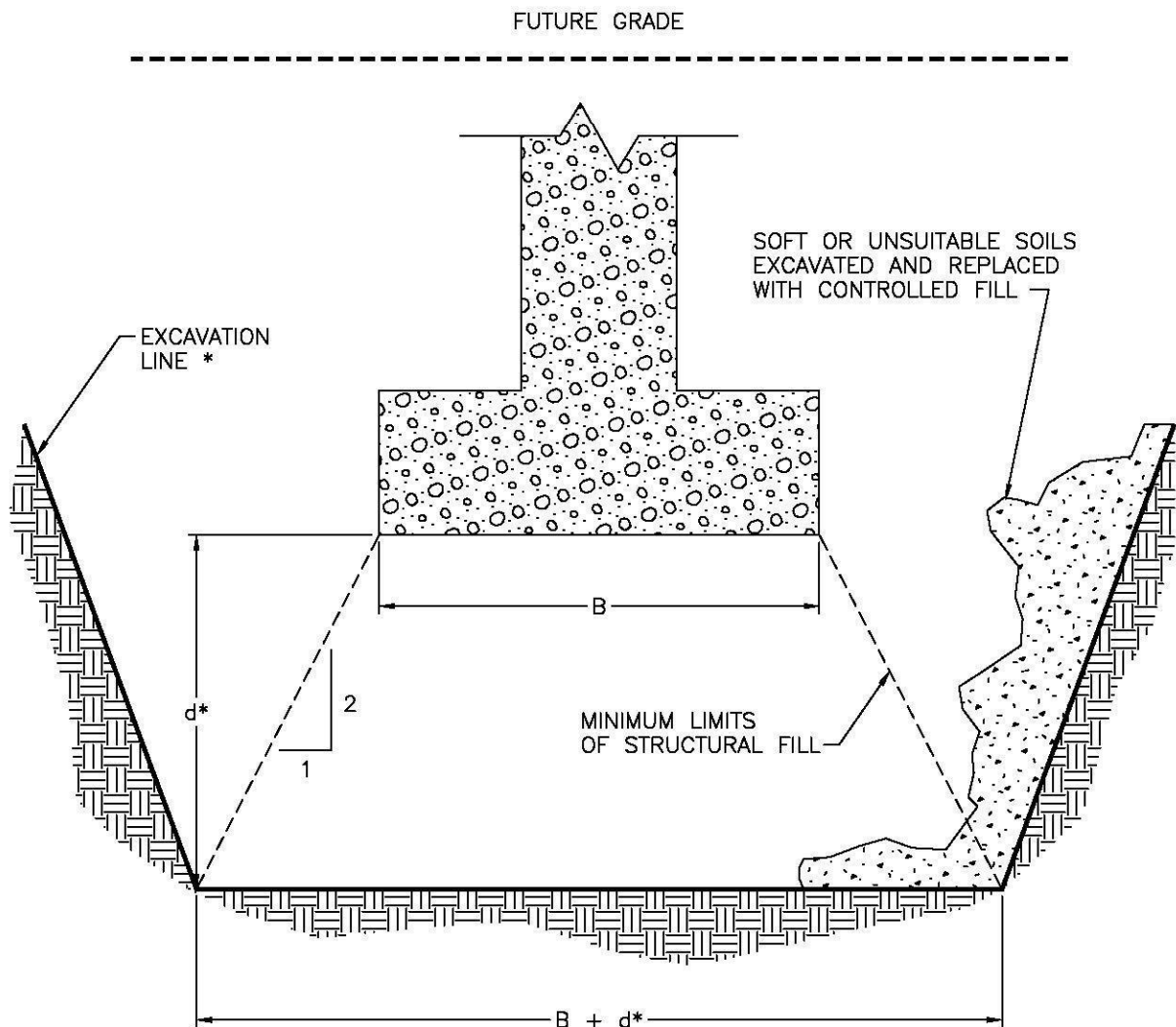
Upon completion of the boring program, all of the samples retrieved during drilling were returned to *Patriot's* soil testing laboratory where they were visually examined and classified. A laboratory-generated log of each boring was prepared based upon the driller's field log, laboratory test results, and our visual examination. Test boring logs and a description of the classification system are included in Appendix "A" in this report. Indicated on each log are: the primary strata encountered, the depth of each stratum change, the depth of each sample, the Standard Penetration Test results, groundwater conditions, and selected laboratory test data. The laboratory logs were prepared for each boring giving the appropriate sample data and the textural description and classification.

6.2 Laboratory Testing

Representative samples recovered in the borings were selected for testing in the laboratory to evaluate their physical properties and engineering characteristics. Laboratory analysis included Natural Moisture Content Analysis (ASTM D 2216) and an estimate of the unconfined compressive strength (q_u) of the cohesive soil samples utilizing a calibrated hand penetrometer (q_p) were obtained. The results of laboratory tests are summarized in Section 3.2 "*General Subsurface Conditions*". Soil descriptions on the boring logs are in accordance with the Unified Soil Classification System (USCS).

7.0 ILLUSTRATIONS

See Illustrations "A" and "B" on the following pages. These illustrations are presented to further visually clarify several of the construction considerations presented in Section 5.2 "*Foundation Excavations*".



*d IS DEPTH TO SUITABLE SOILS

* IN COMPLIANCE WITH OSHA STANDARDS

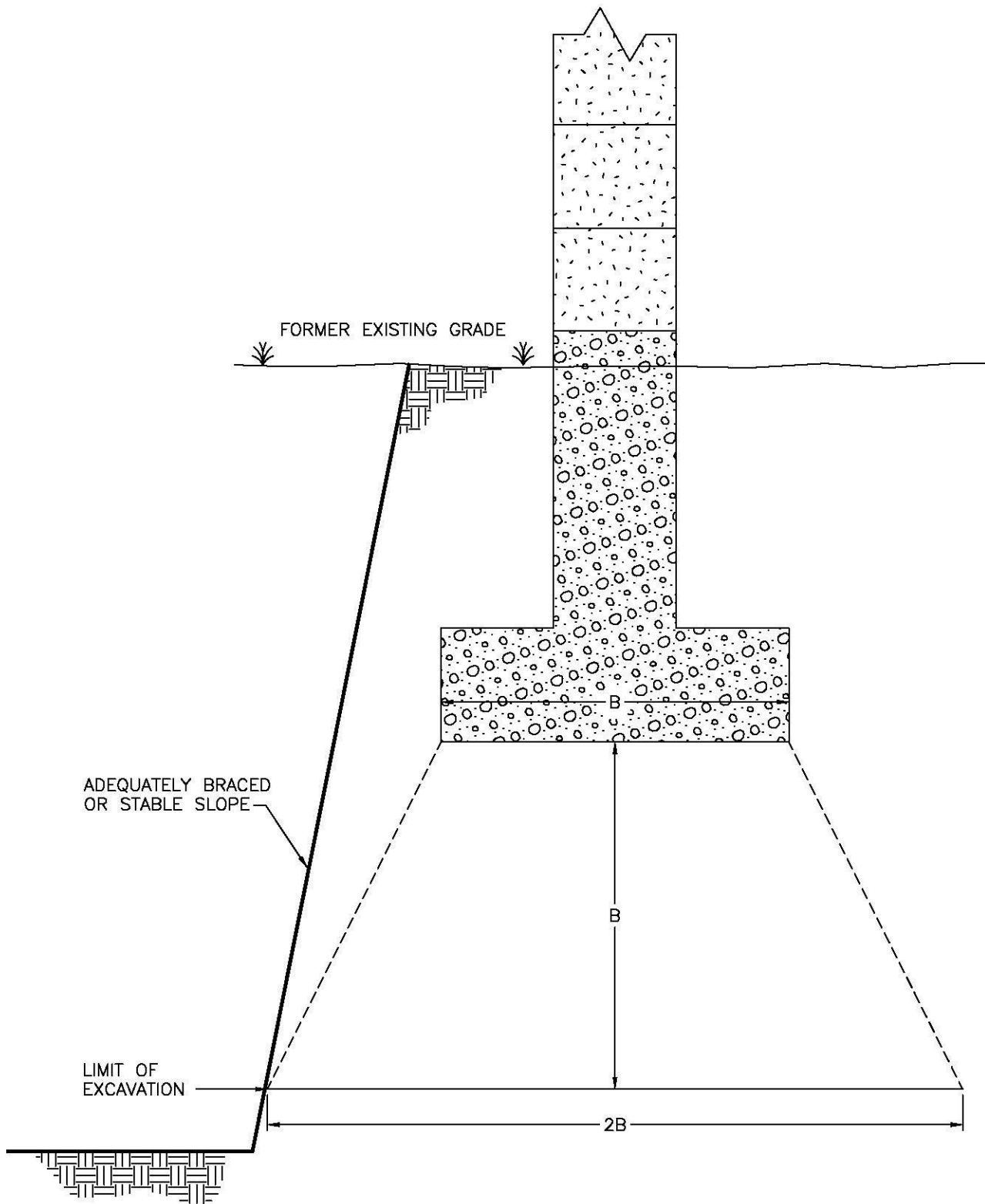
Excavation for Footings In an Area of Fill ILLUSTRATION A

job. no.:

figure:



**PATRIOT ENGINEERING
and Environmental, Inc.**
Engineering Value for Project Success
Consulting Environmental, Geotechnical
and Materials Engineers



**PATRIOT ENGINEERING
and Environmental, Inc.**
Engineering Value for Project Success
Consulting Environmental, Geotechnical
and Materials Engineers

Excavation Near Existing In Use Foundations ILLUSTRATION B

job. no.:

figure:

APPENDIX A

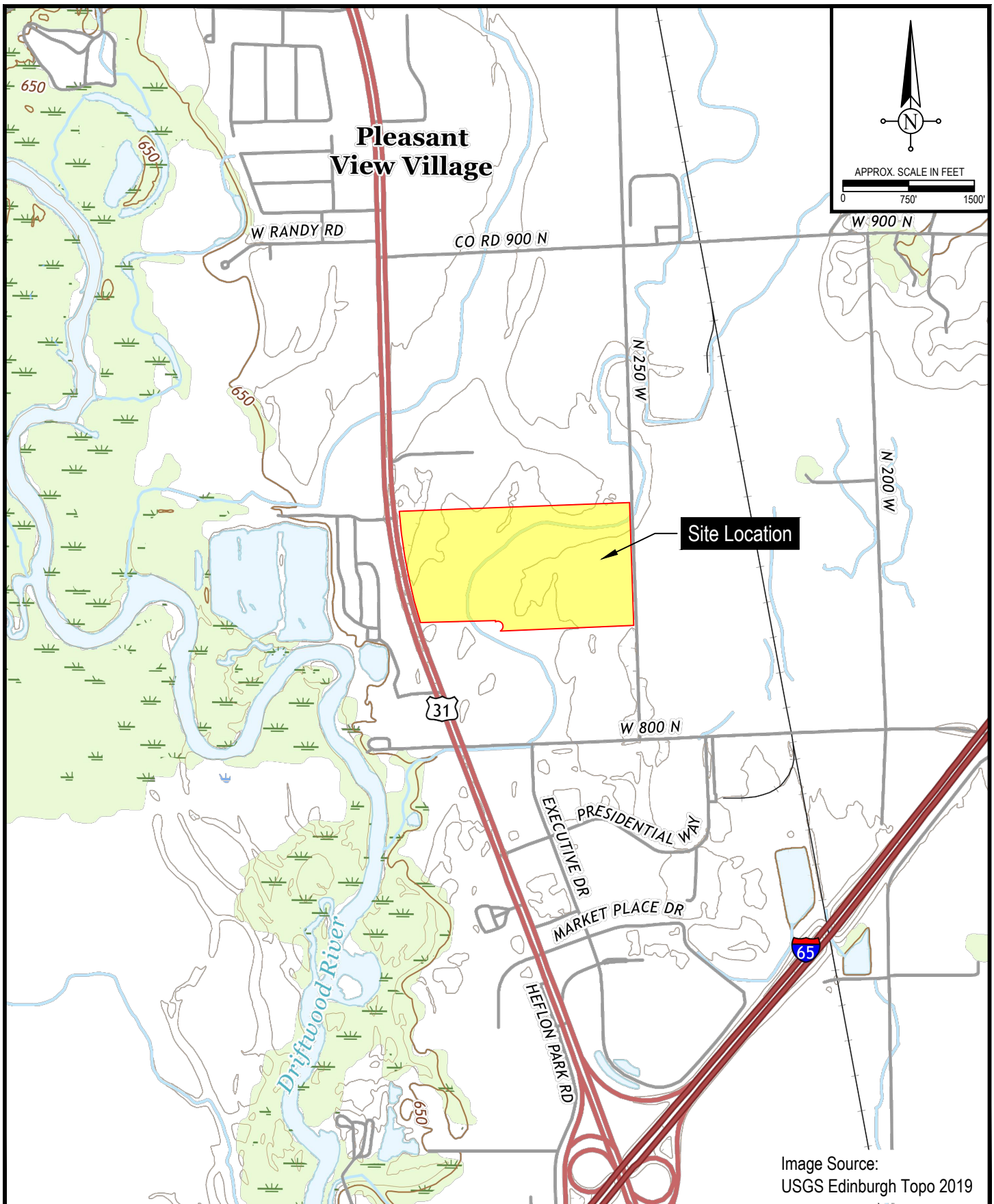
SITE VICINITY MAP (FIGURE NO. 1)

BORING LOCATION MAP (FIGURE NO. 2)

BORING LOGS

BORING LOG KEY

**UNIFIED SOIL CLASSIFICATION SYSTEM
(USCS)**



**Patriot Engineering &
Environmental, Inc.**

Project: Truck Terminal - R&L Carriers
US 31
Edinburgh, Indiana

Project Number: 20-0986-01
Date: September 3, 2020

Drawn By: J. DuMond
Approved: L. Young
DWG: 20-0986-01_geo

Figure 1

Site Vicinity Map

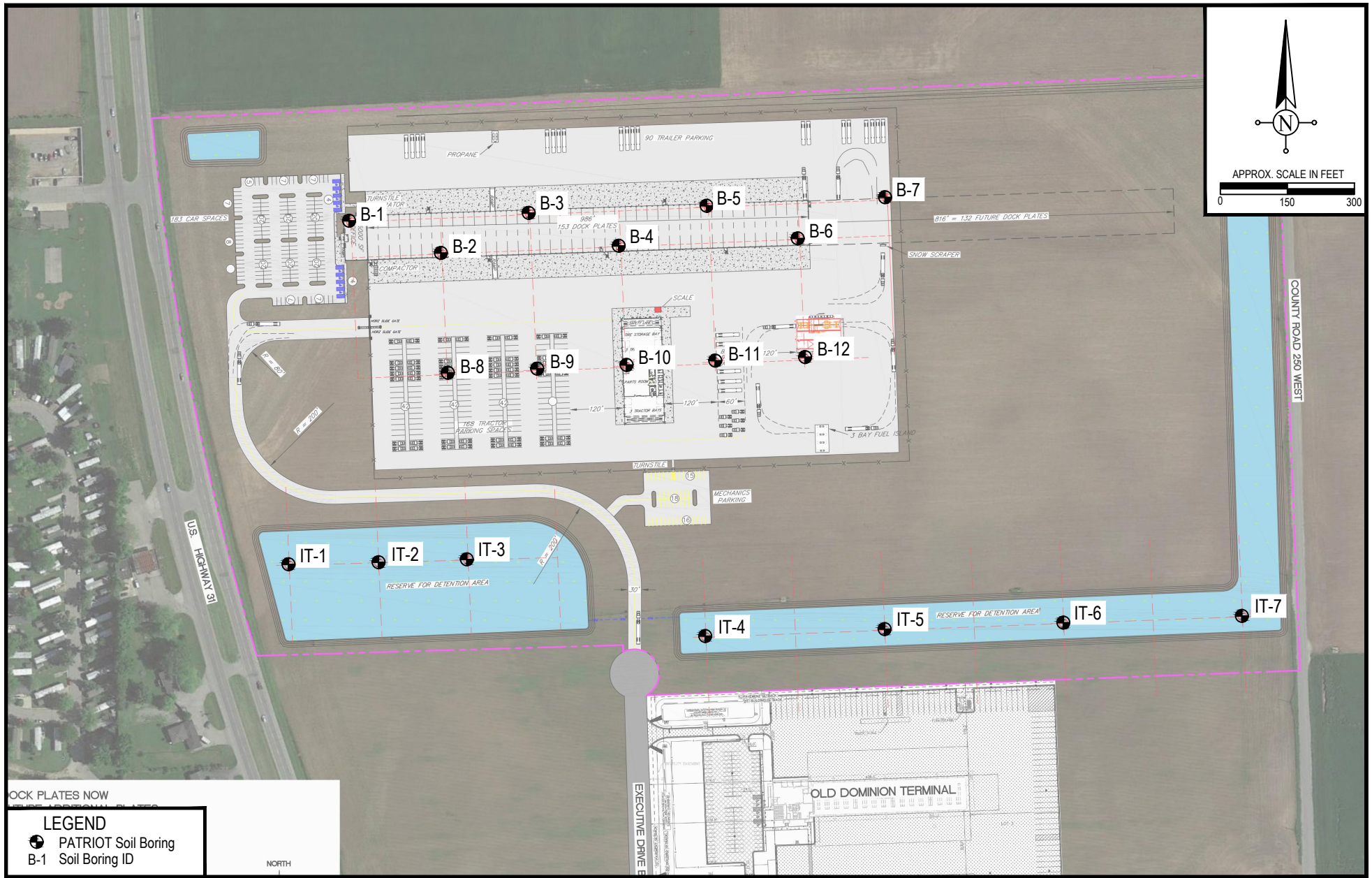


Figure 2

Soil Boring Location Map



**PATRIOT ENGINEERING
and Environmental Inc.**

Indianapolis, Terre Haute, Evansville,
Fort Wayne, Lafayette, Bloomington
Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING B-1

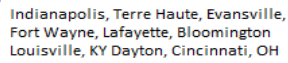
(Page 1 of 1)

Truck Terminal - R&L Carriers
Edinburgh, IN

Client Name : R&L Carriers
Project Number : 20-0986-01G
Logged By : L. Young
Start Date : 8/17/2020
Drilling Method : HSA

Driller : C. Dolan
Sampling : Splitspoon

Depth (Feet)	Water Level	USCS	GRAPHIC	Water Levels ▼ During Drilling - 19.0 feet ▽ After Completion - Dry ◆ After 24 Hours - N/A	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
				DESCRIPTION						
0				TOPSOIL (12")						
		CL		Brown, slightly moist, stiff, SILTY CLAY with some gravel	1	78	4/6/9		14	
					2	83	3/4/2			
5				Brown, slightly moist, loose to medium dense, fine to medium grained, SAND with trace silt and trace gravel	3	78	2/3/5			
		SP-SM			4	83	4/8/3			
10										
					5	83	14/10/10			
15		SP-SM		Brown, slightly moist, medium dense, fine to medium grained, SAND with trace silt and little gravel						
					6	22	10/12/11			
20		SP-SM		Brown, slightly moist, medium dense, fine to medium grained, SAND with trace silt and trace gravel						
					7	72	7/7/6			
25		SP-SM		Brown, saturated, medium dense, fine to medium grained, SAND with trace silt and trace gravel						
										Boring caved to 19 feet upon auger removal.
				Boring terminated at 25 feet.						
30										



(Page 1 of 1)

Driller : C. Dolan
Sampling : Splitspoon

C:\Users\young\young\Patriot Engineering\GEO - Documents\Documents\2020 mtech\2020 mtech\0986-01G\B-2.bor



**PATRIOT ENGINEERING
and Environmental Inc.**

Indianapolis, Terre Haute, Evansville,
Fort Wayne, Lafayette, Bloomington
Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING B-3

(Page 1 of 1)

Truck Terminal - R&L Carriers
Edinburgh, IN

Client Name : R&L Carriers
Project Number : 20-0986-01G
Logged By : L. Young
Start Date : 8/17/2020
Drilling Method : HSA

Driller : C. Dolan
Sampling : Splitspoon

Depth (Feet)	Water Level	USCS	GRAPHIC	Water Levels ▼ During Drilling - 18.5 feet ▽ After Completion - Dry ◆ After 24 Hours - N/A	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
				DESCRIPTION						
0				TOPSOIL (12")						
		CL		Brown, moist, stiff, SILTY CLAY with trace sand and trace gravel	1	78	2/4/5	2.25	20	
		SP-SM		Brown, slightly moist, very loose, fine to medium grained, SAND with trace silt and trace gravel	2	83	2/1/3			
5				Brown, slightly moist, medium dense, fine to medium grained, SAND with trace silt and trace gravel	3	83	3/2/2			
				Brown, slightly moist, medium dense, fine to medium grained, SAND with trace silt and trace gravel	4	83	6/9/12			
10		SP-SM		Brown, saturated, medium dense, fine to medium grained, SAND with trace silt and trace gravel	5	94	9/6/8			
		SP-SM		Brown, saturated, medium dense, fine to medium grained, SAND with trace silt and trace gravel	6	67	8/7/6			
15				Brown, saturated, medium dense, medium grained, SAND and gravel with trace silt	7	50	7/9/9			
20										
25				Boring terminated at 25 feet.						Boring caved to 17 feet upon auger removal.
30										



PATRIOT ENGINEERING
and Environmental Inc.

Indianapolis, Terre Haute, Evansville,
Fort Wayne, Lafayette, Bloomington
Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING B-4

(Page 1 of 1)

Truck Terminal - R&L Carriers
Edinburgh, IN

Client Name : R&L Carriers
Project Number : 20-0986-01G
Logged By : L. Young
Start Date : 8/17/2020
Drilling Method : HSA

Driller : C. Dolan
Sampling : Splitspoon

Depth (Feet)	Water Level	USCS	GRAPHIC	Water Levels ▼ During Drilling - 18.5 feet ▽ After Completion - Dry ◆ After 24 Hours - N/A	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
				DESCRIPTION						
0				TOPSOIL (12")						
		CL		Brown, moist, medium stiff to stiff, SILTY CLAY with trace sand	1	67	2/3/4	1.75	21.2	
					2	94	2/1/1			
5				Brown, slightly moist, very loose, fine to medium grained, SAND with trace silt and trace gravel	3	89	1/1/1			
		SP-SM			4	78	2/1/3			
10										
				Brown, slightly moist, medium dense, fine to medium grained, SAND with trace silt and trace gravel	5	89	18/13/10			
15		SP-SM								
				Brown, saturated, medium dense, fine to medium grained, SAND with trace silt and trace gravel	6	67	8/7/6			
20		SP-SM			7	61	6/7/8			
25										Boring caved to 17.75 feet upon auger removal.
				Boring terminated at 25 feet.						
30										

LOG OF BORING B-5

(Page 1 of 1)

Truck Terminal - R&L Carriers
Edinburgh, IN

Client Name : R&L Carriers
Project Number : 20-0986-01G
Logged By : L. Young
Start Date : 8/17/2020
Drilling Method : HSA

Driller : C. Dolan
Sampling : Splitspoon

Depth (Feet)	Water Level	USCS	GRAPHIC	Water Levels ▼ During Drilling - Dry ▽ After Completion - 16.5 feet ◆ After 24 Hours - N/A	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
				DESCRIPTION						
0				TOPSOIL (12")						
		CL		Brown, moist, soft, SILTY CLAY with little sand	1	33	3/2/2		17	
5					2	33	2/2/2		18	
		SP-SM		Brown, slightly moist, medium dense to dense, fine to medium grained, SAND with trace silt and trace gravel	3	83	15/14/16			
10					4	89	15/12/13			
15					5	89	19/17/15			
	▽									Boring caved to 16.5 feet upon auger removal.
20		SP-SM		Brown, saturated, medium dense, fine to medium grained, SAND with trace silt and trace gravel	6	56	8/7/6			
25					7	39	7/9/7			
				Boring terminated at 25 feet.						
30										



PATRIOT ENGINEERING
and Environmental Inc.

Indianapolis, Terre Haute, Evansville,
Fort Wayne, Lafayette, Bloomington
Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING B-6

(Page 1 of 1)

Truck Terminal - R&L Carriers
Edinburgh, IN

Client Name : R&L Carriers
Project Number : 20-0986-01G
Logged By : L. Young
Start Date : 8/17/2020
Drilling Method : HSA

Driller : C. Dolan
Sampling : Splitspoon

Depth (Feet)	Water Level	USCS	GRAPHIC	Water Levels	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
				DESCRIPTION						
0				TOPSOIL (12")						
		CL		Brown, slightly moist, medium stiff, SILTY CLAY with trace sand	1	28	3/3/3		14	
		SP-SM		Brown, slightly moist, very loose, fine to medium grained, SAND with trace silt and trace gravel	2	83	1/2/1			
5		SP-SM		Brown, slightly moist, loose, fine to medium grained, SAND with trace silt and trace gravel	3	67	4/4/5			
		SP-SM		Brown, slightly moist, loose, fine to medium grained, SAND with trace silt	4	89	9/5/5			
10										
		GP-GM		Brown, saturated, medium dense, GRAVEL with trace sand and trace silt	5	78	7/8/8			
15										
		SP-SM		Brown, saturated, medium dense, fine to medium grained, SAND with trace silt and trace gravel	6	67	11/9/11			
20										
		SP-SM		Brown, saturated, medium dense, fine to medium grained, SAND with trace silt and trace gravel	7	67	10/14/16			
25										
				Boring terminated at 25 feet.						
30										



**PATRIOT ENGINEERING
and Environmental Inc.**

Indianapolis, Terre Haute, Evansville,
Fort Wayne, Lafayette, Bloomington
Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING B-7

(Page 1 of 1)

Truck Terminal - R&L Carriers
Edinburgh, IN

Client Name : R&L Carriers
Project Number : 20-0986-01G
Logged By : L. Young
Start Date : 8/17/2020
Drilling Method : HSA

Driller : C. Dolan
Sampling : Splitspoon

Depth (Feet)	Water Level	USCS	GRAPHIC	Water Levels ▼ During Drilling - 13.5 feet ▽ After Completion - Dry ◆ After 24 Hours - N/A	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
				DESCRIPTION						
0				TOPSOIL (12")						
		CL		Brown, moist, soft, SILTY CLAY with trace sand	1	89	1/2/2		21	
		CL		Brown, moist, stiff, SILTY CLAY with trace sand and trace gravel	2	100	6/7/7		23	
5		CL		Brown, moist, soft, SILTY CLAY with trace sand and trace gravel	3	100	2/1/3		16	
		SP-SM		Brown, slightly moist, very loose, fine to medium grained, SAND with trace silt and trace gravel	4	83	1/1/2			
10										
	▼	SP-SM		Brown, saturated, loose, fine to medium grained, SAND with trace silt and trace gravel	5	83	5/4/4			Boring caved to 14 feet upon auger removal.
15										
		SP-SM		Brown, saturated, medium dense, fine to medium grained, SAND with trace silt and trace gravel	6	61	4/6/10			
20										
		SP-SM			7	56	7/8/8			
25				Boring terminated at 25 feet.						
30										



**PATRIOT ENGINEERING
and Environmental Inc.**

Indianapolis, Terre Haute, Evansville,
Fort Wayne, Lafayette, Bloomington
Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING B-8

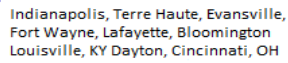
(Page 1 of 1)

Truck Terminal - R&L Carriers
Edinburgh, IN

Client Name : R&L Carriers
Project Number : 20-0986-01G
Logged By : L. Young
Start Date : 8/17/2020
Drilling Method : HSA

Driller : C. Dolan
Sampling : Splitspoon

Depth (Feet)	Water Level	USCS	GRAPHIC	Water Levels ▼ During Drilling - Dry ▽ After Completion - Dry ◆ After 24 Hours - N/A	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
				DESCRIPTION						
0				TOPSOIL (12")						
		CL		Brown, moist, medium stiff to stiff, SILTY CLAY with trace sand	1	100	1/2/3	2.0	16	
5					2	67	2/3/4	1.75	21	
		SP-SM		Brown, slightly moist, very loose, fine to medium grained, SAND with trace silt	3	33	W/O/H			WOH - Weight of Hammer
10		SP-SM		Brown, slightly moist, very loose, fine to medium grained, SAND with trace silt and trace gravel	4	44	W/O/H			
15		SP-SM		Brown, slightly moist, medium dense, fine to medium grained, SAND with trace silt and trace gravel	5	94	7/8/8			Boring caved to 13.25 feet upon auger removal.
				Boring terminated at 15 feet.						Groundwater was not encountered during drilling, nor upon completion.
20										
25										
30										



(Page 1 of 1)

Driller : C. Dolan
Sampling : Splitspoon

09-08-2020 C:\Users\young\Patriot Engineering\GEO - Documents\Mtech\2020 mtech mtech\0986-01 G\B-9.bor



PATRIOT ENGINEERING and Environmental Inc.

Indianapolis, Terre Haute, Evansville,
Fort Wayne, Lafayette, Bloomington
Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING B-10

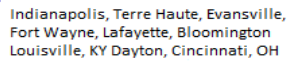
(Page 1 of 1)

Truck Terminal - R&L Carriers
Edinburgh, IN

Client Name : R&L Carriers
Project Number : 20-0986-01G
Logged By : L. Young
Start Date : 8/17/2020
Drilling Method : HSA

Driller : C. Dolan
Sampling : Splitspoon

Depth (Feet)	Water Level	USCS	GRAPHIC	Water Levels	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
				DESCRIPTION						
0				TOPSOIL (12")						
		CL		Brown, moist, medium stiff, SILTY CLAY with trace sand	1	44	2/3/2		19	
		SP-SM		Brown, slightly moist, very loose, fine to medium grained, SAND with trace silt and trace gravel	2	56	1/2/2			
5		SP-SM		Brown, slightly moist, loose, fine to medium grained, SAND with trace silt and trace gravel	3	78	3/4/4			
		SP-SM		Brown, slightly moist, medium dense, fine to medium grained, SAND with trace silt	4	89	7/7/8			
10										
		SP-SM		Brown, saturated, loose, fine to medium grained, SAND with trace silt and trace gravel	5	67	6/3/4			Boring caved to 12 feet upon auger removal.
15										
		SP-SM		Brown, saturated, very loose, fine to medium grained, SAND with trace silt and trace gravel	6	89	1/WH/1			WOH - Weight of Hammer
20										
		SP-SM		Brown, saturated, medium dense, fine to medium grained, SAND with trace silt and trace gravel	7	67	7/8/8			
25										
				Boring terminated at 25 feet.						
30										



(Page 1 of 1)

Driller : C. Dolan
Sampling : Splitspoon

09-08-2020 C:\Users\young\Patriot Engineering\GEO - Documents\Mtech\2020 mtech\0986-01G\B-11.bor



**PATRIOT ENGINEERING
and Environmental Inc.**

Indianapolis, Terre Haute, Evansville,
Fort Wayne, Lafayette, Bloomington
Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING B-12

(Page 1 of 1)

Truck Terminal - R&L Carriers
Edinburgh, IN

Client Name : R&L Carriers
Project Number : 20-0986-01G
Logged By : L. Young
Start Date : 8/17/2020
Drilling Method : HSA

Driller : C. Dolan
Sampling : Splitspoon

Depth (Feet)	Water Level	USCS	GRAPHIC	Water Levels	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
				DESCRIPTION						
0				TOPSOIL (12")						
		CL		Brown, moist, stiff, SILTY CLAY with trace sand	1	78	3/2/3		22.3	
					2	94	5/5/4			
5		SP-SM		Brown, slightly moist, loose to medium dense, fine to medium grained, SAND with trace silt and trace gravel	3	83	7/9/11			
					4	94	13/9/9			
10										
				Boring terminated at 10 feet.						Groundwater was not encountered during drilling, nor upon completion.
15										
20										
25										
30										



PATRIOT ENGINEERING
and Environmental Inc.

Indianapolis, Terre Haute, Evansville,
Fort Wayne, Lafayette, Bloomington
Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING IT-1

(Page 1 of 1)

Truck Terminal - R&L Carriers
Edinburgh, IN

Client Name : R&L Carriers
Project Number : 20-0986-01G
Logged By : L. Young
Start Date : 8/17/2020
Drilling Method : HSA

Driller : C. Dolan
Sampling : Splitspoon

Depth (Feet)	Water Level	USCS	GRAPHIC	Water Levels ▼ During Drilling - Dry ▽ After Completion - 18.0 feet ◆ After 24 Hours - N/A	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
				DESCRIPTION						
0				TOPSOIL (12")						
		CL		Brown, moist, medium stiff, SILTY CLAY with trace sand	1	78	2/3/5		16	
					2	89	2/3/3			
5				Brown, slightly moist, loose to very loose, fine to medium grained, SAND with silt and trace gravel	3	22	W/O/H			
		SP-SM			4	78	W/O/H			WOH - Weight of Hammer
10										
				Brown, slightly moist, medium dense, fine to medium grained, SAND with trace silt and trace gravel	5	78	2/4/8			
15		SP-SM								
					6	67	5/5/6			Boring caved to 18.5 feet upon auger removal.
20		SP-SM		Brown, saturated, medium dense, fine to medium grained, SAND with trace silt and trace gravel						
				Boring terminated at 20 feet.						
25										
30										



PATRIOT ENGINEERING
and Environmental Inc.

Indianapolis, Terre Haute, Evansville,
Fort Wayne, Lafayette, Bloomington
Louisville, KY Dayton, Cincinnati, OH









LOG OF BORING IT-2

(Page 1 of 1)

Truck Terminal - R&L Carriers
Edinburgh, IN

Client Name : R&L Carriers
Project Number : 20-0986-01G
Logged By : L. Young
Start Date : 8/17/2020
Drilling Method : HSA

Driller : C. Dolan
Sampling : Splitspoon

Depth (Feet)	Water Level	USCS	GRAPHIC	Water Levels	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS	
				▼ During Drilling - Dry ▽ After Completion - 18.0 feet ◆ After 24 Hours - N/A							DESCRIPTION
0				TOPSOIL (12")						WOH - Weight of Hammer	
		CL		Brown, moist, medium stiff, SILTY CLAY with trace silt and trace gravel	1	33	2/4/3		19		
		SP-SM		Brown, slightly moist, very loose, fine to medium grained, SAND with trace silt and trace gravel	2	37	1WOH/1				
5				Brown, slightly moist, loose, fine to medium grained, SAND with trace silt and trace gravel	3	37	4/3/2				
		SP-SM			4	78	4/5/5				
10				Brown, slightly moist, medium dense, fine to medium grained, SAND with trace silt and trace gravel	5	72	13/12/15				
15		SP-SM								Boring caved to 18.5 feet upon auger removal.	
	▽	SP-SM		Brown, saturated, loose, fine to medium grained, SAND with little gravel and trace silt	6	67	7/4/6				
20		Boring terminated at 20 feet.									
25											
30											



PATRIOT ENGINEERING
and Environmental Inc.

Indianapolis, Terre Haute, Evansville,
Fort Wayne, Lafayette, Bloomington
Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING IT-3

(Page 1 of 1)

Truck Terminal - R&L Carriers
Edinburgh, IN

Client Name : R&L Carriers
Project Number : 20-0986-01G
Logged By : L. Young
Start Date : 8/17/2020
Drilling Method : HSA

Driller : C. Dolan
Sampling : Splitspoon

Depth (Feet)	Water Level	USCS	GRAPHIC	Water Levels ▼ During Drilling - Dry ▽ After Completion - 15.0 feet ◆ After 24 Hours - N/A	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
				DESCRIPTION						
0				TOPSOIL (12")						
		SP-SM		Brown, slightly moist, very loose, fine to medium grained, SAND with trace silt and trace gravel	1	67	1/2/1			
		SP-SM		Brown, slightly moist, loose, fine to medium grained, SAND with trace silt and trace gravel	2	89	3/4/3			
5										
				Brown, slightly moist, medium dense, fine to medium grained, SAND with trace silt and trace gravel	3	83	7/6/6			
					4	83	4/5/6			
10		SP-SM								
				Brown, saturated, medium dense, fine to medium grained, SAND with trace silt and trace gravel	5	78	4/5/6			
15	▽	SP-SM								Boring caved to 15.5 feet upon auger removal.
					6	83	8/9/6			
20										
				Boring terminated at 20 feet.						
25										
30										



**PATRIOT ENGINEERING
and Environmental Inc.**

Indianapolis, Terre Haute, Evansville,
Fort Wayne, Lafayette, Bloomington
Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING IT-4

(Page 1 of 1)

Truck Terminal - R&L Carriers
Edinburgh, IN

Client Name : R&L Carriers
Project Number : 20-0986-01G
Logged By : L. Young
Start Date : 8/17/2020
Drilling Method : HSA

Driller : C. Dolan
Sampling : Splitspoon

Depth (Feet)	Water Level	USCS	GRAPHIC	Water Levels ▼ During Drilling - Dry ▽ After Completion - 18.0 feet ◆ After 24 Hours - N/A	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
				DESCRIPTION						
0				TOPSOIL (12")						
		CL		Brown, slightly moist, medium stiff, SILTY CLAY with trace sand and trace gravel	1	61	4/4/3		12	
		CL		Brown, moist, soft, SILTY CLAY with trace sand and trace gravel	2	100	3/1/1		24	
5				Brown, slightly moist, medium dense, fine to medium grained, SAND with trace sand and trace gravel	3	78	4/8/9			
					4	78	9/8/11			
10										
		SP-SM			5	78	18/12/13			
15										
	▽									
20		SP-SM		Brown, saturated, medium dense, fine to medium grained, SAND with trace silt and trace gravel	6	78	8/8/8			Boring caved to 18 feet upon auger removal.
				Boring terminated at 20 feet.						
25										
30										



(Page 1 of 1)

Client Name : R&L Carriers
Project Number : 20-0986-01G
Logged By : L. Young
Start Date : 8/17/2020
Drilling Method : HSA

[illegible]



**PATRIOT ENGINEERING
and Environmental Inc.**

Indianapolis, Terre Haute, Evansville,
Fort Wayne, Lafayette, Bloomington
Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING IT-6

(Page 1 of 1)

Truck Terminal - R&L Carriers
Edinburgh, IN

Client Name : R&L Carriers
Project Number : 20-0986-01G
Logged By : L. Young
Start Date : 8/17/2020
Drilling Method : HSA

Driller : C. Dolan
Sampling : Splitspoon

Depth (Feet)	Water Level	USCS	GRAPHIC	Water Levels ▼ During Drilling - Dry ▽ After Completion - 17.0 feet ◆ After 24 Hours - N/A	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
				DESCRIPTION						
0				TOPSOIL (12")						
		CL		Brown, slightly moist, medium stiff, SILTY CLAY with trace sand and trace gravel	1	67	3/4/3		15	
				Brown, slightly moist, medium dense, fine to medium grained, SAND with trace silt and trace gravel	2	67	4/6/7			
5					3	67	6/6/7			
		SP-SM			4	83	12/13/13			
10					5	67	9/8/9			
15										
	▽									
		SP-SM		Brown, saturated, loose, fine to medium grained, SAND with trace silt and trace gravel	6	67	5/3/5			
20										Boring caved to 17 feet upon auger removal.
				Boring terminated at 20 feet.						
25										
30										



**PATRIOT ENGINEERING
and Environmental Inc.**

Indianapolis, Terre Haute, Evansville,
Fort Wayne, Lafayette, Bloomington
Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING IT-7

(Page 1 of 1)

Truck Terminal - R&L Carriers
Edinburgh, IN

Client Name : R&L Carriers
Project Number : 20-0986-01G
Logged By : L. Young
Start Date : 8/17/2020
Drilling Method : HSA

Driller : C. Dolan
Sampling : Splitspoon

Depth (Feet)	Water Level	USCS	GRAPHIC	Water Levels ▼ During Drilling - Dry ▽ After Completion - 18.0 ◆ After 24 Hours - N/A	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
				DESCRIPTION						
0				TOPSOIL (12")						
		CL		Brown, slightly moist, medium stiff, SILTY CLAY with trace sand and trace gravel	1	56	3/3/2		15	
				Brown, slightly moist, loose to medium dense, fine to medium grained, SAND with trace silt and trace gravel	2	72	4/4/4			
5					3	72	7/5/5			
					4	67	5/7/10			
10		SP-SM								
					5	83	15/15/13			
15										
	▽									
		SP-SM		Brown, saturated, medium dense, fine to medium grained, SAND with trace silt and trace gravel	6	83	7/7/10			
20										Boring caved to 18 feet upon auger removal.
				Boring terminated at 20 feet.						
25										
30										

BORING LOG KEY

UNIFIED SOIL CLASSIFICATION SYSTEM FIELD CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

NON COHESIVE SOILS

(Silt, Sand, Gravel and Combinations)

Density		Grain Size Terminology		
		<u>Soil Fraction</u>	<u>Particle Size</u>	<u>US Standard Sieve Size</u>
Very Loose	-4 blows/ft. or less			
Loose	-5 to 10 blows/ft.			
Medium Dense	-11 to 30 blows/ft.	Boulders	Larger than 12"	Larger than 12"
Dense	-31 to 50 blows/ft.	Cobbles	3" to 12"	3" to 12"
Very Dense	-51 blows/ft. or more	Gravel: Coarse	¾" to 3"	¾" to 3"
		Small	4.76mm to ¾"	#4 to ¾"
		Sand: Coarse	2.00mm to 4.76mm	#10 to #4
		Medium	0.42mm to 2.00mm	#40 to #10
		Fine	0.074mm to 0.42mm	#200 to #40
		Silt	0.005mm to 0.074 mm	Smaller than #200
		Clay	Smaller than 0.005mm	Smaller than #200

RELATIVE PROPORTIONS FOR SOILS

<u>Descriptive Term</u>	<u>Percent</u>
Trace	1 - 10
Little	11 - 20
Some	21 - 35
And	36 - 50

COHESIVE SOILS

(Clay, Silt and Combinations)

<u>Consistency</u>	<u>Unconfined Compressive Strength (tons/sq. ft.)</u>	<u>Field Identification (Approx.) SPT Blows/ft.</u>
Very Soft	Less than 0.25	0 - 2
Soft	0.25 - < 0.5	3 - 4
Medium Stiff	0.5 - < 1.0	5 - 8
Stiff	1.0 - < 2.0	9 - 15
Very Stiff	2.0 - < 4.0	16 - 30
Hard	Over 4.0	> 30

Classification on logs are made by visual inspection.

Standard Penetration Test - Driving a 2.0" O.D., 1^{3/8}" I.D., sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30.0 inches. It is customary for **Patriot** to drive the spoon 6.0 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the tests are recorded for each 6.0 inches of penetration on the drill log (Example - 6/8/9). The standard penetration test results can be obtained by adding the last two figures (i.e. 8 + 9 = 17 blows/ft.).

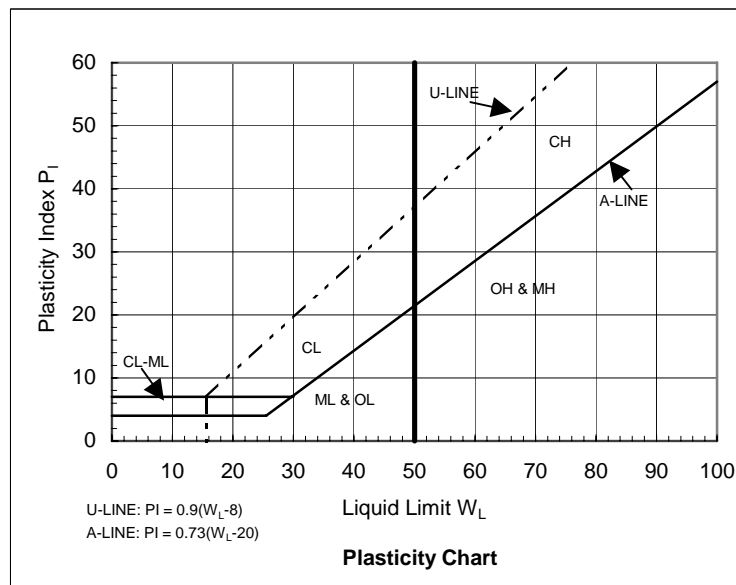
Strata Changes - In the column "Soil Descriptions" on the drill log the horizontal lines represent strata changes. A solid line (——) represents an actually observed change, a dashed line (- - - -) represents an estimated change.

Groundwater observations were made at the times indicated. Porosity of soil strata, weather conditions, site topography, etc., may cause changes in the water levels indicated on the logs.

Groundwater symbols: ▼-observed groundwater elevation, encountered during drilling; ∇-observed groundwater elevation upon completion of boring.

Unified Soil Classification System

Major Divisions			Group Symbol		Typical Names	Classification Criteria for Coarse-Grained Soils		
Coarse-grained soils (more than half of material is larger than No. 200)	Gravels (more than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (little or no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines	$C_U \geq 4$ $1 \leq C_C \leq 3$	$C_U = \frac{D_{60}}{D_{10}}$	$C_C = \frac{D_{30}^2}{D_{10} D_{60}}$
			GP		Poorly graded gravels, gravel-sand mixtures, little or no fines	Not meeting all gradation requirements for GW ($C_U < 4$ or $1 > C_C > 3$)		
		Gravels with fines (appreciable amount of fines)	GM	$\frac{d_u}{u}$	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below A line or $P_L < 4$		Above A line with $4 < P_L < 7$ are borderline cases requiring use of dual symbols
			GC		Clayey gravels, gravel-sand-clay mixtures	Atterberg limits above A line or $P_L > 7$		
	Sands (more than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines	$C_U \geq 6$ $1 \leq C_C \leq 3$	$C_U = \frac{D_{60}}{D_{10}}$	$C_C = \frac{(D_{30})^2}{D_{10} D_{60}}$
			SP		Poorly graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW ($C_U < 6$ or $1 > C_C > 3$)		
		Sands with fines (appreciable amount of fines)	SM	$\frac{d_u}{u}$	Silty sands, sand-silt mixtures	Atterberg limits below A line or $P_L < 4$		Limits plotting in hatched zone with $4 \leq P_L \leq 7$ are borderline cases requiring use of dual symbols
			SC		Clayey sands, sand-clay mixtures	Atterberg limits above A line with $P_L > 7$		
Fine-grained soils (more than half of material is smaller than No. 200)	Silt and clays (liquid limit <50)	ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity	<div>1. Determine percentages of sand and gravel from grain size curve.</div> <div>2. Depending on percentages of fines (fraction smaller than 200 sieve size), coarse-grained soils are classified as follows: Less than 5% - GW, GP, SW, SP More than 12% - GM, GC, SM, SC 5-12% - Borderline cases requiring dual symbols</div>			
		CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays				
		OL		Organic silts and organic silty clays of low plasticity				
	Silt and clays (liquid limit >50)	MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts				
		CH		Inorganic clays or high plasticity, fat clays				
		OH		Organic clays of medium to high plasticity, organic silts				
	Highly organic soils	PT		Peat and other highly organic soils				



APPENDIX B

SEISMIC SITE CLASS EVALUATION



Search Information

Coordinates: 39.32236981541132, -85.96660910644528

Elevation: 658 ft

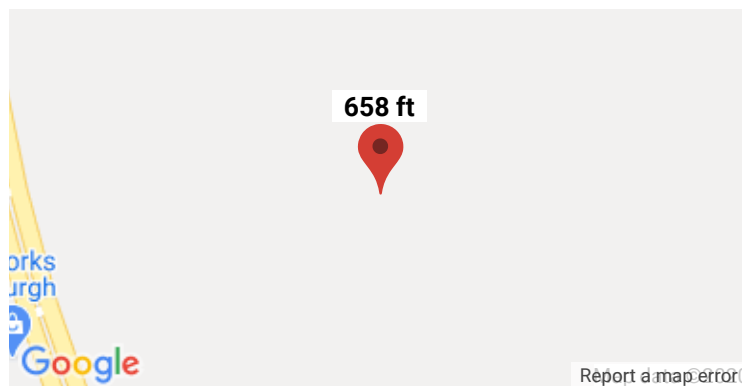
Timestamp: 2020-09-02T15:05:34.310Z

Hazard Type: Seismic

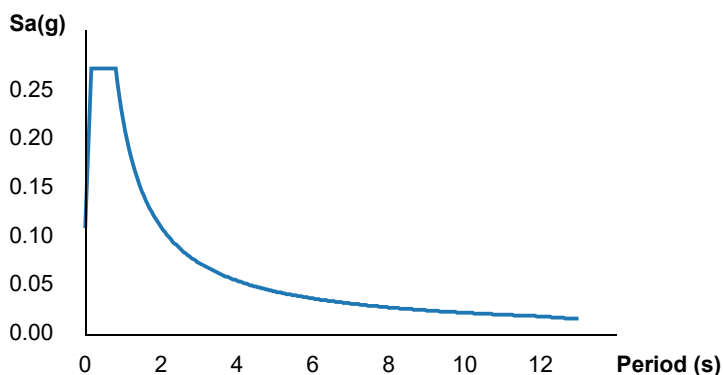
Reference Document: IBC-2012

Risk Category: II

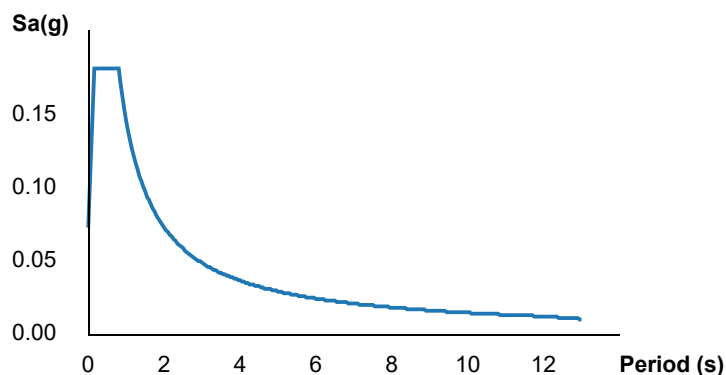
Site Class: D



MCER Horizontal Response Spectrum



Design Horizontal Response Spectrum



Basic Parameters

Name	Value	Description
S_S	0.171	MCE_R ground motion (period=0.2s)
S_1	0.092	MCE_R ground motion (period=1.0s)
S_{MS}	0.273	Site-modified spectral acceleration value
S_{M1}	0.22	Site-modified spectral acceleration value
S_{DS}	0.182	Numeric seismic design value at 0.2s SA
S_{D1}	0.146	Numeric seismic design value at 1.0s SA

Additional Information

Name	Value	Description
SDC	C	Seismic design category
F_a	1.6	Site amplification factor at 0.2s
F_v	2.4	Site amplification factor at 1.0s
CR_S	0.904	Coefficient of risk (0.2s)

CR ₁	0.864	Coefficient of risk (1.0s)
PGA	0.078	MCE _G peak ground acceleration
F _{PGA}	1.6	Site amplification factor at PGA
PGA _M	0.125	Site modified peak ground acceleration
T _L	12	Long-period transition period (s)
SsRT	0.171	Probabilistic risk-targeted ground motion (0.2s)
SsUH	0.189	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.092	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.106	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)
PGAd	0.6	Factored deterministic acceleration value (PGA)

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey [Seismic Design Web Services](#).

While the information presented on this website is believed to be correct, ATC and its sponsors and contributors assume no responsibility or liability for its accuracy. The material presented in the report should not be used or relied upon for any specific application without competent examination and verification of its accuracy, suitability and applicability by engineers or other licensed professionals. ATC does not intend that the use of this information replace the sound judgment of such competent professionals, having experience and knowledge in the field of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the results of the report provided by this website. Users of the information from this website assume all liability arising from such use. Use of the output of this website does not imply approval by the governing building code bodies responsible for building code approval and interpretation for the building site described by latitude/longitude location in the report.

APPENDIX C

Pavement Design Evaluation and Design Sections

WinPAS

Pavement Thickness Design According to
1993 AASHTO Guide for Design of Pavements Structures
American Concrete Pavement Association

Flexible Design Inputs

Project Name: Truck Terminal - R&L Carriers
Route:
Location: Edinburgh, Indiana
Owner/Agency:
Design Engineer:

Flexible Pavement Design/Evaluation

Structural Number	2.51	Subgrade Resilient Modulus	3,750.00 psi
Total Flexible ESALs	50,000	Initial Serviceability	4.20
Reliability	80.00 percent	Terminal Serviceability	2.00
Overall Standard Deviation	0.45		

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.39	0.40	1.50	0.23
Asphalt Cement Concrete	0.36	0.40	3.50	0.50
Crushed Stone Base	0.34	0.40	6.00	0.82
Σ SN				1.55

WinPAS

Pavement Thickness Design According to
1993 AASHTO Guide for Design of Pavements Structures
American Concrete Pavement Association

Rigid Design Inputs

Project Name: Truck Terminal - R&L Carriers
Route:
Location: Edinburgh, Indiana
Owner/Agency:
Design Engineer:

Rigid Pavement Design/Evaluation

Concrete Thickness	10.85 inches	Load Transfer Coefficient	3.20
Total Rigid ESALs	16,800,000	Modulus of Subgrade Reaction	75 psi/in.
Reliability	80.00 percent	Drainage Coefficient	1.00
Overall Standard Deviation	0.35	Initial Serviceability	4.50
Flexural Strength	580 psi	Terminal Serviceability	2.00
Modulus of Elasticity	3,600,000 psi		

Modulus of Subgrade Reaction (k-value) Determination

Resilient Modulus of the Subgrade	0.0
Unadjusted Modulus of Subgrade Reaction	0
Depth to Rigid Foundation	0.00
Loss of Support Value (0,1,2,3)	0.0

Modulus of Subgrade Reaction	75 psi/in.
------------------------------	------------

APPENDIX D

GENERAL QUALIFICATIONS

**STANDARD CLAUSE FOR UNANTICIPATED
SUBSURFACE CONDITIONS**

GENERAL QUALIFICATIONS
of Patriot Engineering's Geotechnical Engineering Investigation

This report has been prepared at the request of our client for his use on this project. Our professional services have been performed, findings obtained, and recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties either expressed or implied.

The scope of our services did not include any environmental assessment or investigation for the presence or absence of wetlands, hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studied. Any statements in this report or on the test borings logs regarding vegetation types, odors or staining of soils, or other unusual conditions observed are strictly for the information of our client and the owner.

This report may not contain sufficient information for purposes of other parties or other uses. This company is not responsible for the independent conclusions, opinions or recommendations made by others based on the field and laboratory data presented in this report. Should there be any significant differences in structural arrangement, loading or location of the structure, our analysis should be reviewed.

The recommendations provided herein were developed from the information obtained in the test borings, which depict subsurface conditions only at specific locations. The analysis, conclusions, and recommendations contained in our report are based on site conditions as they existed at the time of our exploration. Subsurface conditions at other locations may differ from those occurring at the specific drill sites. The nature and extent of variations between borings may not become evident until the time of construction. If, after performing on-site observations during construction and noting the characteristics of any variation, substantially different subsurface conditions from those encountered during our explorations are observed or appear to be present beneath excavations, we must be advised promptly so that we can review these conditions and reconsider our recommendations where necessary.

If there is a substantial lapse of time between the submission of our report and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, we urge that our report be reviewed to determine the applicability of the conclusions and recommendations considering the changed conditions and time lapse.

We urge that Patriot be retained to review those portions of the plans and specifications that pertain to earthwork and foundations to determine whether they are consistent with our recommendations. In addition, we are available to observe construction, particularly the compaction of structural backfill and preparation of the foundations, and such other field observations as may be necessary.

In order to fairly consider changed or unexpected conditions that might arise during construction, we recommend the following verbiage (Standard Clause for Unanticipated Subsurface Conditions) be included in the project contract.

STANDARD CLAUSE FOR UNANTICIPATED SUBSURFACE CONDITIONS

"The owner has had a subsurface exploration performed by a soils consultant, the results of which are contained in the consultant's report. The consultant's report presents his conclusions on the subsurface conditions based on his interpretation of the data obtained in the exploration. The contractor acknowledges that he has reviewed the consultant's report and any addenda thereto, and that his bid for earthwork operations is based on the subsurface conditions as described in that report. It is recognized that a subsurface exploration may not disclose all conditions as they actually exist and further, conditions may change, particularly groundwater conditions, between the time of a subsurface exploration and the time of earthwork operations. In recognition of these facts, this clause is entered in the contract to provide a means of equitable additional compensation for the contractor if adverse unanticipated conditions are encountered and to provide a means of rebate to the owner if the conditions are more favorable than anticipated.

At any time during construction operations that the contractor encounters conditions that are different than those anticipated by the soils consultant's report, he shall immediately (within 24 hours) bring this fact to the owner's attention. If the owner's representative on the construction site observes subsurface conditions which are different than those anticipated by the consultant's report, he shall immediately (within 24 hours) bring this fact to the contractor's attention. Once a fact of unanticipated conditions has been brought to the attention of either the owner or the contractor, and the consultant has concurred, immediate negotiations will be undertaken between the owner and the contractor to arrive at a change in contract price for additional work or reduction in work because of the unanticipated conditions. The contract agrees that the following unit prices would apply for additional or reduced work under the contract. For changed conditions for which unit prices are not provided, the additional work shall be paid for on a time and materials basis."

Another example of a changed conditions clause can be found in paper No. 4035 by Robert F. Borg, published in ASCE Construction Division Journal, No. CO2, September 1964, page 37.



November 23, 2020

R+L Carriers
215 West Curry Road
Wilmington, Ohio 45177

Attn: Neil Mullins, PE / Project Manager
E: neil.mullins@rlcarriers.com

Re: Infiltration Test Report
New R+L Carriers Service Center
Edinburgh, Indiana
Terracon Project No. CJ205434

Dear Mr. Mullins:

Terracon Consultants, Inc. (Terracon) has completed the infiltration testing for the referenced project. The description of the infiltration test method and results are discussed below.

1.0 FIELD WORK PERFORMED

Four infiltration tests were performed at the project site at depths ranging from ~6 to 6.5 feet BG (below grade) below the existing ground surface. The general location of the test locations is shown on the attached Exploratory Plan (**Appendix A**). The infiltration tests were prepared and performed by the following procedures:

- Placing an approximately 3-inch layer of coarse sand from depths of ~6.25 to 6.5 feet BG (borings **IT-1** and **IT-2**), and from ~5.75 to 6 feet BG (borings **IT-3** and **IT-4**);
- Seating the 4-inch diameter PVC casing into the coarse sand layer at a depth of ~6.3 feet BG (**IT-1** and **IT-2**) and at a depth of ~5.8 feet (**IT-3** and **IT-4**);
- Backfilling the annulus space between the borehole and PVC casing with bentonite chips from 2.25 to 6.25 feet BG (**IT-1** and **IT-2**); from ~2 to 5.75 feet (**IT-3** and **IT-4**);
- The subsurface soils were “pre-soaked” by introducing water into the casing and a constant water head was applied for 30 minutes to simulate saturated conditions;
- The test began immediately after the “pre-soak” by filling the casing with water;
- The flow rate was measured directly from the rate of decline of the water level within the casing; and
- Following the completion of the infiltration test, the casing was removed, and the borehole was backfilled with bentonite chips.

Terracon Consultants, Inc. 7770 West New York Street Indianapolis, Indiana 46214
P (317) 273 1690 F (317) 273 2250 terracon.com

Infiltration Test Report

New R+L Carriers Service Center ■ Edinburgh, Indiana
November 23, 2020 ■ Terracon Project No. CJ205434



2.0 INFILTRATION TEST RESULTS

A summary of the infiltration test results is summarized in the table below:

Test Number	Test Depth (feet below grade)	Predominant Soil Type at Test Depth	Infiltration Rate (inches per hour)
IT-1	6.5	Sand (SP)	57
IT-2	6.5	Sand with Silt (SP-SM)	9
IT-3	6	Sand (SP)	90
IT-4	6	Sand (SP)	14

The subsurface conditions observed at each test location are presented in the attached boring logs (**Appendix B**). Supporting information is attached in **Appendix C**.

We trust that this information is sufficient for your current needs. Please contact us should you have any questions or you need further assistance with this project.

Sincerely,

Terracon Consultants, Inc.

Tanner Hill, PE
Senior Staff Engineer

Rick Ricci, PG, CPG
Senior Project Geologist

Attachments:

Appendix A: Figures
Appendix B: Boring Logs
Appendix C: Supporting Information

APPENDIX A

Figures

- Exploration Plan

EXPLORATION PLAN

New R+L Carriers Service Center ■ Edinburgh, Indiana

November 23, 2020 ■ Terracon Project No. CJ205434



DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

APPENDIX B

Boring Logs

- Boring Logs IT-1 through IT-4

BORING LOG NO. IT-1

Page 1 of 1

PROJECT: R&L Carriers Service Center

CLIENT: R & L Carriers
Wilmington, OH

SITE: 250 East 800 North
Edinburgh, IN

GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 39.322° Longitude: -85.97°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (FIELD TEST RESULTS	LABORATORY HP (tsf)
	DEPTH ELEVATION (Ft.)						
0.6	TOPSOIL , (7 in)						
	SANDY LEAN CLAY (CL) , trace gravel, brown, very stiff			X	18	6-8-10 N=18	2.0 (HP)
4.0	SAND (SP) , trace gravel, fine to coarse grained, brown, moist, loose to medium dense, poorly graded	5		X	18	6-7-9 N=16	
7.5	Boring Terminated at 7.5 Feet			X	18	3-3-4 N=7	

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" HSA

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

WATER LEVEL OBSERVATIONS

No water observed during drilling
No water observed at completion



7770 W New York St
Indianapolis, IN

Boring Started: 11-12-2020

Boring Completed: 11-12-2020

Drill Rig: Geoprobe

Driller: T.B.

Project No.: CJ205434

Cave-in

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. DUKE ENERGY CUSTOM LOG-NO N60 CJ205434 TRUCK TERMINAL.GPJ TERRACON_DATATEMPLATE.GDT 11/20/20

BORING LOG NO. IT-2

Page 1 of 1

PROJECT: R&L Carriers Service Center

CLIENT: R & L Carriers
Wilmington, OH

SITE: 250 East 800 North
Edinburgh, IN

GRAPHIC LOG	LOCATION See Exploration Plan		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	LABORATORY HP (tsf)
	Latitude: 39.322° Longitude: -85.9686°							
DEPTH			ELEVATION (Ft.)					
	0.6	TOPSOIL , (7 in)	5					
		SANDY LEAN CLAY (CL) , trace gravel, brown, stiff						
	2.5	SAND WITH SILT(SP-SM) , trace gravel, fine to coarse grained, brown, moist, medium dense, poorly graded						
	7.5	Boring Terminated at 7.5 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" HSA

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

WATER LEVEL OBSERVATIONS

No water observed during drilling
No water observed at completion



7770 W New York St
Indianapolis, IN

Boring Started: 11-12-2020

Boring Completed: 11-12-2020

Drill Rig: Geoprobe

Driller: T.B.

Project No.: CJ205434

Cave-in

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. DUKE ENERGY CUSTOM LOG-NO N60 CJ205434 TRUCK TERMINAL.GPJ TERRACON_DATATEMPLATE.GDT 11/20/20

BORING LOG NO. IT-3

Page 1 of 1

PROJECT: R&L Carriers Service Center

CLIENT: R & L Carriers
Wilmington, OH

SITE: 250 East 800 North
Edinburgh, IN

GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 39.3216° Longitude: -85.9667°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (FIELD TEST RESULTS	LABORATORY HP (tsf)
	DEPTH ELEVATION (Ft.)						
0.6	TOPSOIL , (7 in)						
	SANDY LEAN CLAY (CL) , trace gravel, brown, stiff			X	17	4-5-7 N=12	1.0 (HP)
3.5	SAND (SP) , trace gravel, fine to coarse grained, brown, moist, medium dense, poorly graded	5		X	15	5-6-6 N=12	
7.5	Boring Terminated at 7.5 Feet			X	18	7-11-18 N=29	

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

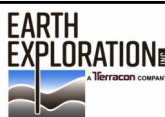
Advancement Method:
6" HSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

Notes:

WATER LEVEL OBSERVATIONS

No water observed during drilling
No water observed at completion



7770 W New York St
Indianapolis, IN

Boring Started: 11-12-2020

Boring Completed: 11-12-2020

Drill Rig: Geoprobe

Driller: T.B.

Project No.: CJ205434

Cave-in

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. DUKE ENERGY CUSTOM LOG-NO N60 CJ205434 TRUCK TERMINAL.GPJ TERRACON_DATATEMPLATE.GDT 11/20/20

BORING LOG NO. IT-4

Page 1 of 1

PROJECT: R&L Carriers Service Center

CLIENT: R & L Carriers
Wilmington, OH

SITE: 250 East 800 North
Edinburgh, IN

GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 39.3217° Longitude: -85.9623°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (FIELD TEST RESULTS	LABORATORY HP (tsf)
	DEPTH ELEVATION (Ft.)						
0.6	TOPSOIL , (7 in)						
	SANDY LEAN CLAY (CL) , trace gravel, brown, stiff			X	18	4-4-6 N=10	1.0 (HP)
3.5	SAND (SP) , trace gravel, fine to coarse grained, brown, moist, loose to medium dense, poorly graded	5		X	18	4-5-6 N=11	
7.5	Boring Terminated at 7.5 Feet			X	15	4-3-3 N=6	

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

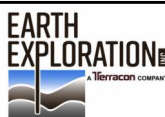
Advancement Method:
6" HSA

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

WATER LEVEL OBSERVATIONS

No water observed during drilling
No water observed at completion



7770 W New York St
Indianapolis, IN

Boring Started: 11-12-2020

Boring Completed: 11-12-2020

Drill Rig: Geoprobe

Driller: T.B.

Project No.: CJ205434

Cave-in

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. DUKE ENERGY CUSTOM LOG-NO N60 CJ205434 TRUCK TERMINAL.GPJ TERRACON_DATATEMPLATE.GDT 11/20/20






APPENDIX C

Supporting Information

- General Notes
- Unified Soil Classification System

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING	 Shelby Tube  Split Spoon	WATER LEVEL	 Water Initially Encountered  Water Level After a Specified Period of Time  Water Level After a Specified Period of Time	FIELD TESTS	N Standard Penetration Test Resistance (Blows/Ft.) (HP) Hand Penetrometer (T) Torvane (DCP) Dynamic Cone Penetrometer (PID) Photo-Ionization Detector (OVA) Organic Vapor Analyzer
			Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.		

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS	RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
	Descriptive Term (Density)	Standard Penetration or N-Value Blows/Ft.	Descriptive Term (Consistency)	Unconfined Compressive Strength Qu, (tsf)	Standard Penetration or N-Value Blows/Ft.
	Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
	Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
	Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8
	Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15
	Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
			Hard	> 4.00	> 30

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A					Soil Classification	
					Group Symbol	Group Name ^B
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels: Less than 5% fines ^C	Cu ≥ 4 and 1 ≤ Cc ≤ 3 ^E	GW	Well-graded gravel ^F	
			Cu < 4 and/or [Cc<1 or Cc>3.0] ^E	GP	Poorly graded gravel ^F	
		Gravels with Fines: More than 12% fines ^C	Fines classify as ML or MH	GM	Silty gravel ^{F, G, H}	
			Fines classify as CL or CH	GC	Clayey gravel ^{F, G, H}	
	Sands: 50% or more of coarse fraction passes No. 4 sieve	Clean Sands: Less than 5% fines ^D	Cu ≥ 6 and 1 ≤ Cc ≤ 3 ^E	SW	Well-graded sand ^I	
			Cu < 6 and/or [Cc<1 or Cc>3.0] ^E	SP	Poorly graded sand ^I	
		Sands with Fines: More than 12% fines ^D	Fines classify as ML or MH	SM	Silty sand ^{G, H, I}	
			Fines classify as CL or CH	SC	Clayey sand ^{G, H, I}	
Fine-Grained Soils: 50% or more passes the No. 200 sieve	Silts and Clays: Liquid limit less than 50	Inorganic:	PI > 7 and plots on or above “A”	CL	Lean clay ^{K, L, M}	
			PI < 4 or plots below “A” line ^J	ML	Silt ^{K, L, M}	
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay ^{K, L, M, N}
			Liquid limit - not dried			Organic silt ^{K, L, M, O}
	Silts and Clays: Liquid limit 50 or more	Inorganic:	PI plots on or above “A” line	CH	Fat clay ^{K, L, M}	
			PI plots below “A” line	MH	Elastic Silt ^{K, L, M}	
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay ^{K, L, M, P}
			Liquid limit - not dried			Organic silt ^{K, L, M, Q}
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat	

^A Based on the material passing the 3-inch (75-mm) sieve.

^B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

^C Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

^D Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

$$E \quad Cu = D_{60}/D_{10} \quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

^F If soil contains $\geq 15\%$ sand, add "with sand" to group name.

^G If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

^H If fines are organic, add "with organic fines" to group name.

^I If soil contains $\geq 15\%$ gravel, add "with gravel" to group name.

^J If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

^K If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

^L If soil contains $\geq 30\%$ plus No. 200 predominantly sand, add "sandy" to group name.

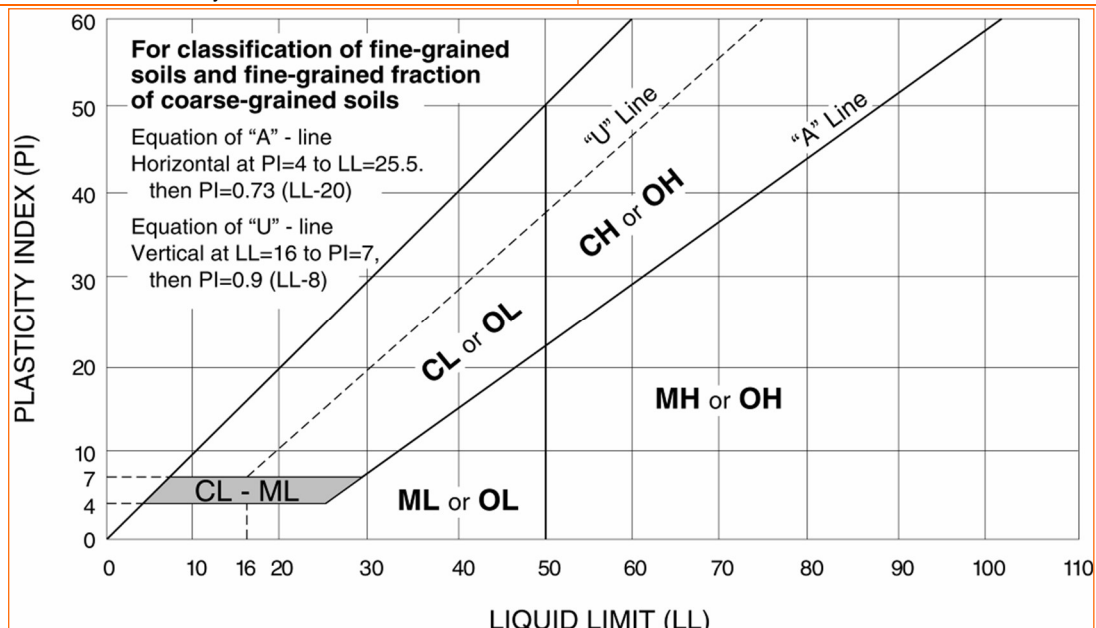
^M If soil contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name.

^N $PI \geq 4$ and plots on or above "A" line.

^O $PI < 4$ or plots below "A" line.

^P PI plots on or above "A" line.

^Q PI plots below "A" line.





December 10, 2020

Mr. Neil Mullins
R&L Carriers
600 Gilman Road
Wilmington, Ohio 45177

Re: Addendum for Geotechnical Report
Truck Terminal – R&L Carriers
250 East 800 North
Edinburgh, Indiana
Patriot Project No. 20-0986-01G

Dear Neil:

As requested, Patriot Engineering and Environmental, Inc. (*Patriot*) is providing the following addendum for the geotechnical engineering investigation report (*Patriot* project number 20-0986-01G and dated September 9th, 2020) completed for R&L Carriers. We understand that R&L Carriers requested *Patriot* to complete an addendum for a heavy-duty asphalt pavement section for the project.

Heavy-Duty Asphalt Pavement

The near surface or shallow subgrade soils encountered within the proposed pavement areas generally consist of medium stiff to stiff silty clays or loose to medium dense sands, which if properly prepared are suitable for pavement support. ***However, soft clays and very loose sands were encountered at or near existing ground surface at some of the boring locations. If encountered during construction or if grade raise fills are planned for these areas, the soft and very loose unsuitable soils should be undercut and replaced with well compacted structural fill prior to construction of pavements or placement of grade raise fills.***

If construction is performed during a wet or cold period, the contractor will need to exercise care during the grading and fill placement activities in order to achieve the necessary subgrade soil support for the pavement section (Refer to Section 5.0 “Construction Considerations”). The base soil for the pavement section will need to be firm and dry. The subgrade should be sloped properly in order to provide good base drainage. To minimize the effects of groundwater or surface water conditions, the base section for the pavement system should be sufficiently high above adjacent ditches and properly graded to provide pavement surface and pavement base drainage.

As requested, *Patriot* is providing minimum design recommendations for a heavy-duty flexible (asphalt) pavement section. These design recommendations have been evaluated and based on the estimated design criteria provided below, along with our evaluation of the subsurface conditions. Our recommended minimum pavement design sections provided

below are based on a soil support evaluation performed in accordance with generally accepted procedures set forth by the American Association of State Highway and Transportation Officials (AASHTO) “*Guide for Design of Pavement Structures, 1993*”. ***The Client has provided required traffic loading for the passenger vehicles and truck traffic. The pavement design is based on the required specifications and the following design assumptions:***

- Design Life of 20 years
- Traffic Loading Conditions:
 - Heavy-Duty Traffic Loading Semi-trucks (280 per day)
- 18-kips Equivalent Single Axle Loading (ESAL) estimated design value:
 - Heavy-Duty Traffic Loading Flexible Pavement = 16,800,000
- Initial Serviceability:
 - Flexible Pavement = 4.2
- Terminal Serviceability of 2.0
- Reliability of 80 percent (%)
- Standard Deviation
 - Flexible Pavement = 0.45
- Estimated California Bearing Ratio (CBR) of 2.5 (or $M_R = 3,750$ psi)
- The crushed stone base course will not contain more than 10 percent (%) fines and will be compacted to at least 100 percent (%) of the maximum Standard Proctor dry density.
- Asphalt will be placed and compacted in accordance with the INDOT 2016 Standard Specification Requirements.
- Periodic Maintenance: We recommend that cracking should be filled and sealed according to INDOT Standard Specification Section 408 periodically after the installation of the pavement. Inspection can also be performed at these times for any isolated areas of excessive fatigue cracking, which could necessitate full-depth patching. Underdrain outlets shall be inspected annually to ensure that there are no man-made or natural obstructions to the flow.
- Good to Excellent Drainage Condition - Assumes water in subgrade is removed within 1 day. Please note, the shallow subgrade soils encountered at the site generally consist of clays with relatively low permeability's, which means the soils have relatively poor drainage characteristics. Therefore, we recommend installing longitudinal subsurface drains throughout the length of the proposed pavement areas. Additionally, we recommend the installation of series of finger drains within the proposed pavement areas, which if appropriate and feasible could be connected to storm-sewer inlets. In addition to providing good drainage, the installation of underdrains underlying pavement sections founded over low permeability soils will generally aid in improving long-term performance of the pavement sections, as well as helping lower maintenance costs.

Based on the above design parameters, provided below are the calculated minimum pavement design thicknesses for a flexible (asphalt) pavement section.

**Table No. 1: Flexible Pavement Design (Minimum Thicknesses)
(Heavy-Duty Asphalt)**

Traffic Loading Conditions⁽¹⁾	Asphalt Surface Course HMA 9.5 mm (Inches)⁽²⁾	Asphalt Base Course HMA 19 mm (Inches)⁽²⁾	Aggregate Sub-Base (Inches)⁽³⁾	Design Life (Years)
16,800,000 ESAL's	2.0	10	10	20

⁽¹⁾ Estimated ESAL based on estimated number of truck passes per day

⁽²⁾ Indiana Department of Transportation (INDOT) Specified Hot Mix Asphalt (HMA)

⁽³⁾ Indiana Department of Transportation (INDOT) No. 53 Crushed Stone, containing no more than 10 percent (%) fines.

If you have any questions regarding this reliance letter, please do not hesitate to contact our office.

Respectfully submitted,
Patriot Engineering and Environmental, Inc.



Logan Young, E.I.
Geotechnical Engineer



Salim Ilmudeen, P.E.
Principal Engineer



Attachment A: Pavement Design Evaluation and Design Sections

WinPAS

Pavement Thickness Design According to
1993 AASHTO Guide for Design of Pavements Structures
American Concrete Pavement Association

Flexible Design Inputs

Project Name: R&L Carriers Truck Terminal
Route: Truck Route
Location:
Owner/Agency: R&L Carriers
Design Engineer: Heavy Duty Asphalt

Flexible Pavement Design/Evaluation

Structural Number	6.14	Subgrade Resilient Modulus	3,619.20 psi
Total Flexible ESALs	16,800,000	Initial Serviceability	4.20
Reliability	80.00 percent	Terminal Serviceability	2.30
Overall Standard Deviation	0.45		

Layer Pavement Design/Evaluation

Layer Material	Layer Coefficient	Drainage Coefficient	Layer Thickness	Layer SN
Asphalt Cement Concrete	0.42	1.00	2.00	0.84
Asphalt Treated Agg. Base	0.39	1.00	10.00	3.90
Crushed Stone Base	0.14	1.00	10.00	1.40
Σ SN				6.14

#5147

END OF SECTION

SECTION 03 00 50CONCRETE FOUNDATION WORK

The requirements of the "General Conditions", the "Supplementary Conditions", and "Division 1" sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, and equipment necessary to complete all Concrete Foundation Work, including building foundations, gate post foundations, footings, mass concrete pours, retaining walls, fence posts, and installation of items in concrete, as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:
1. Forms for Concrete Work.
 2. Steel Reinforcement.
 3. Reinforced and Unreinforced Concrete.
 4. Grout under Leveling Plates at Column Base Plates.
 5. Sleeves, Supports, Ties, and similar items.
 6. Set and build-in items furnished by others.
- B. Related Sections: The following items of related Work will be provided under other sections of the Specifications as indicated:
1. Concrete Slabs and Sidewalks - Section 03 30 00.
 2. Miscellaneous Metal Work - Section 05 50 00.
 3. Metal Building Systems - Section 13 34 19.
 4. Embedded Items and Sleeves - Specified under Division 22 and Division 26.
 5. Foundation Excavation and Backfill - Section 31 23 16.
 6. Chain Link Fences and Gates - Section 32 31 13.

1.02 REFERENCE SPECIFICATIONS

- A. Except as otherwise specified herein, design, materials and workmanship shall conform to the current editions of the following specifications. Contractor shall obtain, at own expense, copies of all the following reference specifications, and have available at the Project field office.
- B. American Concrete Institute (ACI) publications, and the related ASTM International Standard Specifications referenced therein.
1. SP-15 ACI Field Reference Manual: Standard Specifications for Structural Concrete ACI 301 w/Selected ACI Reference.

2. SP-66 ACI Detailing Manual (formerly ACI 315).
 3. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
 4. ACI 305R - Guide to Hot Weather Concreting.
 5. ACI 306R - Guide to Cold Weather Concreting.
 6. ACI 308R - Guide to Curing Concrete.
 7. ACI 318 - Building Code Requirements for Structural Concrete (Chapters 3-7).
 8. ACI 347 - Guide to Formwork for Concrete.
- C. ASTM International Standard Specifications, as referred to herein.

1.03 SITE INFORMATION

- A. Site Examination: Contractor shall examine the site to ascertain the state thereof and to understand the complexities of the Work. Compare the site with the Drawings, the condition of the premises, the actual elevations, existing obstructions, areas of Work and other conditions that would affect the completion of the Work.

1.04 QUALITY ASSURANCE

- A. General: Provide all labor, equipment, technical services, and materials necessary to produce, place and finish concrete free from defects. Any concrete failing to meet the requirements of the Specifications will be rejected. Contractor shall, at his expense, remove all rejected concrete from the premises, (including other materials or Work damaged in removing) and replace with concrete complying with these Specifications, also replacing other material and Work affected.

1.05 SUBMITTALS

- A. General: Submit Shop Drawings, Product Data, and Material Submittals to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Shop Drawings: Submit complete Shop Drawings for all reinforcing steel, including bar bends, hooks, and lap splice dimensions.
- C. Laboratory Test Reports: Submit test data for concrete materials and concrete mix designs, including admixture data sheets, not less than fourteen (14) days before scheduled concrete placement.
1. Test Data: Provide for each concrete mix design; test data showing that the 28 day strength meets the required design specifications.
- D. Material Approvals: Unless otherwise required by the Architect, no materials shall be ordered, delivered, fabricated or erected until the proper approvals by the Architect have been received by the General Contractor.

PART 2 - PRODUCTS

2.01 CONCRETE DESIGN

- A. General: All concrete, unless otherwise specified, shall consist of Portland Cement, coarse aggregate, fine aggregate and water.

- B. Types of Concrete: Refer to Structural Drawings.
- C. AE Concrete: Air-entrained concrete shall be made with Type III (High Early Strength) cement shall have 28 day strength in 7 days. Air content for air-entrained concrete (all exterior concrete) shall be 6%, plus or minus 1%.
- D. Concrete Strengths and Locations:
1. AE4500 p.s.i. Concrete: Poured-in-place concrete retaining walls, exterior exposed concrete foundation walls.
 2. 4000 p.s.i. Concrete: Formed concrete.
 3. 3000 p.s.i. Concrete: Mass concrete pours, column and wall footings, and underpinning.
 4. 1500 p.s.i. Concrete: Concrete fill.

2.02 CONCRETE MATERIALS

- A. Cement: A standard brand of Portland Cement conforming to ASTM C150 - Standard Specification for Portland Cement, for Types I or III. Cement shall be kept dry at all times and only one brand shall be used for Concrete Work in any one section of the Project.
- B. Aggregate: Coarse and fine aggregate conforming to ASTM C33 - Standard Specification for Concrete Aggregates, requirements for hardness, durability, purity, and gradations.
1. Coarse Aggregate: Gravel or dolomite stone of the following sizes; footings and walls, 1-1/2" to No. 4. Mixed and unwashed aggregate shall not be used in the Work.

TABLE 1 - AGGREGATE SIZE

NOMINAL AGGREGATE SIZE	MSDH ASTM C33	REFERENCE	SIEVE SIZE				(PASSING BY WEIGHT)		
			2"	1-1/2"	1"	3/4"	1/2"	3/8"	#4
1-1/2"	467	None	100 ----	95 to 100	----	35 to 70	----	10 to 30	0 to 5
1"	57	6	----	100	95 to 100	----	25 to 60	----	0 to 5
3/4"	67	17	----	----	100	90 to 100	----	20 to 55	0 to 10

2. Fine Aggregate: Clean, hard, durable, uncoated grains of natural sand, free from silt, loam, and clay. Range in the following sizes by percentage of weight:

Passing	3/8"	Sieve:	100%
Passing No.	4	Sieve:	95% - 100%
Passing No.	8	Sieve:	65% - 95%
Passing No.	16	Sieve:	35% - 75%
Passing No.	30	Sieve:	20% - 55%
Passing No.	50	Sieve:	15% - 30%
Passing No.	100	Sieve:	0% - 10%
- C. Mixing Water: Potable water (suitable for drinking) shall be clean, free from oils, alkalies, acids, organic water, or other deleterious materials.

D. Admixtures:

1. Air-Entraining Admixtures: Concrete required to be air-entrained shall contain an air-entraining admixture approved by the Architect/Engineer and shall conform to ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
2. Prohibited Admixtures: Do not use calcium chloride, or other similar additives containing salts.
3. Other Admixtures: All other admixtures, to retard or accelerate setting, to reduce water ratio, or to prevent freezing shall conform to ASTM C494 - Standard Specification for Chemical Admixtures for Concrete; shall have long term test data proving its non-corrosive effect on reinforcing steel; and shall not be used without prior written approval from the Owner's Supervising Engineer.

2.03 REINFORCING STEEL

- A. General: "Reinforcing Steel" shall include all bars, rods, stirrups, hooks, temperature steel, dowels, ties, tie wires, chains, spacers and other accessories necessary or required to fully complete the Work.
- B. Cold Drawn Wire: Conforming to ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
- C. Welded Wire Reinforcement: Conforming to ASTM A185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
- D. Reinforcing Steel Bars: 3/8" and larger, shall be deformed bars conforming to ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement, including Supplementary Requirement S1, Grade 60.
- E. Condition of Materials: Reinforcement shall be cleaned of all mill or excessive rust scale and shall be free from all coatings that will destroy or reduce bond.

2.04 FORMS

- A. General: Furnish all forms to confine the concrete and shape it to the required dimensions. Forms shall have sufficient strength to withstand pressures resulting from placement and vibration of the concrete and shall have sufficient rigidity to maintain specified tolerances.
- B. Design: Formwork shall be designed for the loads, lateral pressure, and allowable stresses outlined in Chapter 2 - Design, of reference specification ACI 347, and for design consideration and requirements of the local building code.
- C. Form Release Coating:
 1. Products and Manufacturers: Concrete form release coating shall be one of the following products, or other comparable equivalent approved non-staining release agent guaranteed against interference with bonding of finish materials.
 - a. Product and Manufacturer: Euco Super - Slip, as manufactured by The Euclid Chemical Company, 19218 Redwood Road, Cleveland, OH 44110, (216)531-9222 or (800)321-7628; www.euclidchemical.com.
 - b. Product and Manufacturer: Nox-Crete Form Coating, as manufactured by Nox-Crete Products Group, 1444 S. 20th Street., Omaha, NE 68108, (402)341-1976 or (800)669-2738; www.nox-crete.com.

- c. Product and Manufacturer: DUOGARD®, as manufactured by W.R. Meadows, Inc., 300 Industrial Drive, P.O. Box 338, Hampshire, IL 60140-0338, (800)342-5976 or (847)214-2100; www.wrmeadows.com.

2.05 MISCELLANEOUS ITEMS

- A. Non-Shrink Grout: All leveling plates for column bases, and other such locations noted on the Drawings shall be grouted with one of the following products. All exposed grout shall be “NS Grout” by The Euclid Chemical Company.
 - 1. Hi-Flow Grout as manufactured by The Euclid Chemical Company, 19218 Redwood Road, Cleveland, OH 44110, (216)531-9222 or (800)321-7628; www.euclidchemical.com.
 - 2. EMBECO® 885, high-precision, non-shrink cement-based metallic-aggregate grout, by BASF Corporation Building Systems, 889 Valley Park Drive, Shakopee, MN 55379, (800)433-9517 or (800)243-6739; www.BuildingSystems.BASF.com.
- B. Bonding Compound: Bonding agent for concrete shall be “Euco-Weld”, as manufactured by The Euclid Chemical Company, 19218 Redwood Road, Cleveland, OH 44110, (216)531-9222 or (800)321-7628; www.euclidchemical.com. Product shall comply with ASTM C1059 - Standard Specification for Latex Agents for Bonding Fresh To Hardened Concrete.
- C. Waterstops: Rubber waterstop specified herein shall be as manufactured by Williams Products, Inc., 1750 Maplelawn Blvd., Troy, MI 48084, (248)643-6400 or (800)521-9594; www.williamsproducts.net, or comparable equivalent product of other manufacturers, subject to the Architect’s review.
 - 1. Product: Provide Williams Everlastic®-Neoprene Hi-Tensile Rubber Waterstop, Dumbell (DB) profile, of suitable size (not less than 6" wide x 3/8" web thickness). Waterstop shall conform to ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension; and shall not contain any scrap or reprocessed materials.

PART 3 - EXECUTION

3.01 FORMWORK

- A. Furnish and erect all forms to shapes, elevations and dimensions shown on the Drawings for Concrete Work as required throughout. If soil conditions permit and General Contractor’s approval is secured, footings may be placed in earth forms.
- B. Forms for Concrete Work shall be constructed so as to prevent leakage, amply strong, rigidly stayed, braced to prevent bulging or deflection under the weight of liquid concrete and designed for removal that will not damage the surfaces. Use only approved form release coating.
- C. Forms may be removed as soon as the concrete will safely bear its own weight and any superimposed loads. Contractor shall be responsible for early removal.
- D. Pointing of any concrete surface will not be permitted until the Work has been examined by the General Contractor and permission given.
- E. Formwork for exposed concrete walls, bulkheads, and other indicated construction shall be carefully constructed with plywood or other suitable materials with as few joints as possible to give “smooth, true and unbroken concrete surfaces”. All such wall surfaces shall receive a hand-rubbed finish.

3.02 APPLICATION OF FORM RELEASE AGENT

- A. General: Apply to contact surfaces prior to placement of concrete.
- B. Application: Apply form release agent on formwork in accordance with manufacturer's instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.
- C. Prohibited Use of Form Release Agent: Do not apply form release agent to the following:
 - 1. Special Concrete Finishes: Where concrete surfaces are scheduled to receive special finishes, which may be affected by form release agent. Soak contact surfaces of untreated forms with clean water. Keep surfaces wet prior to placing concrete.
 - 2. Wood Grain Finish Surfaces: Where wood graining characteristics are required on finished concrete surfaces. Leave Form Work dry.

3.03 PLACING REINFORCING STEEL

- A. Reinforcing steel shall be installed in accordance with approved Shop Drawings, the "Manual of Standard Practice of the Concrete Reinforcing Steel Institute (CRSI)", and the governing building authority.
 - 1. Minimum lap of spliced bars shall be 30 diameters, unless otherwise noted on the Drawings.
 - 2. Provide 5'-0" corner bars at corners of all walls and wall footings, same size and spacing as horizontal reinforcing.

3.04 TRANSIT MIXED CONCRETE

- A. General: Ready-mixed concrete shall be batched, mixed, and transported in accordance with ASTM C94 - Standard Specification for Ready-Mixed Concrete. Aggregate for the concrete shall comply with the requirements of ASTM C33 - Standard Specification for Concrete Aggregates.
- B. Concrete and Plant Certification: All transit mixed concrete shall be secured from a reputable, established, local supplier, who employs the use of accurate measuring devices, modern plant and equipment, conforming to the "Plant Certification Check List for Certification of Ready Mixed Concrete Production Facilities of the National Ready Mixed Concrete Association" (NRMCA), and is approved by the Architect.
- C. Delivery of Concrete: With each delivery of concrete to the job, the Contractor shall furnish the Owner's Supervising Engineer with a copy of the delivery ticket containing the following information:
 - 1. Name of ready-mix batch plant.
 - 2. Serial number of ticket.
 - 3. Date.
 - 4. Truck Number.
 - 5. Name of Purchaser.
 - 6. Name and location of job.
 - 7. Class or designation of concrete coinciding with an approved mix design.
 - 8. Amount of concrete in cubic yards.

9. Time loaded or first mixing of cement and aggregate.
10. Water added by receiver of concrete, and initials.
11. Reading of revolution counter at first addition of water.
12. Type, brand, and amount of cement.
13. Type, brand, and amount of admixtures.
14. Information to calculate total mixing water added by producer.
15. Maximum size of aggregate.
16. Weight of fine and coarse aggregate.
17. Previously approved ingredients.
18. Signature of redi-mix representative.
19. Time of day.
20. Ambient temperature.
21. Location and intended use of concrete batch.

3.05 CONCRETE TESTING

- A. In accordance with requirements specified in Section 01 45 23 - Testing and Inspecting Services, the Owner will engage the services of an approved, unbiased, Independent Testing Laboratory to make test cylinders and to determine the quality of all concrete and will pay all costs incurred therefrom. The laboratory will issue copies of all reports as specified in Section 01 45 23.
- B. Four (4) test cylinders shall be made from a sample taken from each continuous pour, or from each 150 cubic yards, or fraction thereof, whichever is less, of each class of concrete placed each day. One (1) cylinder shall be field cured similar to concrete placed, and three (3) shall be cured in accordance with ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
- C. One (1) cylinder shall be tested at seven (7) days for strength information, and two (2) cylinders shall be tested at 28 days for acceptance.
- D. Specimens tested at seven (7) days shall show not less than 2/3 of the 28 day design strength, 28 day tested specimens shall show not less than 100% of the 28 day designed strength.
- E. The strength level of the concrete will be considered satisfactory so long as the averages of all sets of three (3) consecutive strength test results equal or exceed the specified strength f'_c , and no individual strength test shall be more than 500 p.s.i. under the specified strength.
- F. Slump tests shall be conducted in accordance with ASTM C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete.

3.06 COLD WEATHER AND HOT WEATHER REQUIREMENTS

- A. If concrete is placed when temperature is 40°F. or lower, all aggregate and mixing water shall be heated so that concrete when placed in the forms shall have a temperature of not less than 60°F., or more than 80°F.

- B. All concrete shall be adequately protected after placing to prevent damage from freezing, by the use of suitable covers and adequate heating equipment. Methods and extent of protection shall meet the approval of the Owner's Supervising Engineer and he shall have authority to order additional protection if in his opinion it is necessary. Frozen and damaged concrete must be removed and replaced at the Contractor's expense.
- C. All cold weather concreting shall conform with requirements and recommendations of referenced standard ACI 306R – Guide to Cold Weather Concreting.
- D. All hot weather concreting shall conform with requirements and recommendations, as required, of referenced standard ACI 305R - Guide to Hot Weather Concreting; especially in regard to material temperatures and curing methods.

3.07 PLACING CONCRETE

- A. Prior to placing concrete; water, ice, snow, and debris shall be removed from the excavation.
- B. Mixing and conveying equipment shall have hardened concrete and other foreign materials removed from inner surfaces before beginning a run of concrete.
- C. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable, by methods which will prevent the separation or loss of the ingredients. It shall be deposited as nearly as possible in its final position to avoid rehandling.
- D. Do not free drop concrete more than 48". Provide suitable and approved placing equipment such as elephant trunks and tremies, or provide openings in sides of forms as required to limit free dropping to the above requirement. At areas where meeting this requirement is not possible, this Contractor shall submit method of minimizing free drops, including distance of free drop, to Architect for approval.
- E. Concrete during and immediately after depositing shall be thoroughly consolidated by means of suitable tools. The concrete shall be thoroughly worked around the reinforcement and into the corners of the form. Vibrating of concrete shall be done by personnel skilled in this type of Work.
- F. When placing concrete against previously placed Concrete Work, thoroughly clean, roughen, and dampen the surfaces, and apply approved "bonding compound" as specified herein. Apply bonding compound in accordance with manufacturer's recommendations. Place new concrete AFTER the bonding compound has dried.
- G. Joints between concrete piers and column footings shall be doveled as detailed or directed. Concrete footings for columns and walls shall be placed in one operation (construction joints not permitted).
- H. Water accumulating during placing shall be removed before additional concrete is placed.
- I. Footings have been designed to bear on firm soil, however, where additional Work beyond that shown is deemed necessary, the Work will be paid for in accordance with prices given in the Contract.
- J. Where bottom elevation of wall footings must be stepped, such steps shall be in the ratio of one unit vertical to two units horizontal with a maximum vertical step of 1'-0" (unless otherwise shown).
- K. Where concrete foundation walls, and other concrete walls are indicated on Drawings, construct such walls of dimensions and with reinforcing steel as noted on the Drawings. Finish tops level and true for reception of walls, floors, and other construction. Chamfer all permanently exposed horizontal edges 3/4", unless otherwise noted on the Drawings.

- L. Before placing concrete walls, foundation walls and piers; thoroughly clean the tops of the foundation. Place the walls and piers complete from foundation top in one placement. Bulk-head the vertical ends of walls at each placing and provide same with keyways and steel dowels to engage succeeding placed sections.
- M. Finish tops of all foundation walls, concrete walls, and piers level; the latter to receive the non-shrink grout beds for setting of leveling plates for steel column base plates.
- N. Provide keyway in tops of foundation walls as/if shown on the Drawings to receive concrete floor slabs.
- O. Provide recesses in tops of foundation walls at piers, where required to provide a setting for the steel columns. After the steel columns are erected and plumbed, fill in such recesses with concrete to supporting pier dimensions, also encase all interior columns with concrete, from top of concrete piers to underside of floor slabs to full pier size.
- P. Set and build-in all materials, anchor bolts, sleeves, angles, which are furnished by other Contractors.
- Q. Provide 3" minimum protection for reinforcing steel when foundation is cast against the earth.

3.08 LEVELING PLATE SETTING

- A. Furnish and install specified non-shrink grout beds approximately 3/4" thick on all piers under all leveling plates for steel column bases. Place and finish grout true, level, and smooth at the exact elevation of the bottom of each column and base plate. Grout shall be permanently set before steel columns are erected. (Leveling plates to be furnished by the Structural Steel Contractor.)

3.09 REPAIRING AND PATCHING

- A. Patch cracks, rock pockets, honeycombs, and holes resulting from the removal of the nail, rod and cone ties, separators, and core samples.

3.10 PROTECTION

- A. All exposed concrete shall be protected during construction.

END OF SECTION

SECTION 03 30 00CAST-IN-PLACE CONCRETE

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, and equipment and services necessary to complete Cast-In-Place Concrete Work, including existing concrete repair Work, as shown on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:
1. Formwork.
 2. Welded Wire Reinforcement.
 3. Reinforced and Unreinforced Concrete.
 4. Concrete Pavements, Slabs and Sidewalks adjacent to Building.
 5. Compacted Granular Fill Subbase under Concrete Slabs and Sidewalks.
 6. Sleeves, Supports, Ties, and Similar Items.
 7. Set and Build-In Items furnished by others.
 8. Installation of Steel Pipe Guard Posts.
 9. Installation of Loading Dock Edge Channels and/or Angles and Bent Steel Plates.
 10. Steel Dowels at Doors.
 11. Vapor Barrier.
- B. Related Sections: The following items of related Work will be provided under other sections of the Specifications as indicated:
1. Concrete Foundations and Column Footings - Section 03 00 50.
 2. Furnishing Steel Pipe Guard Posts - Section 05 50 00.
 3. Furnishing Loading Dock Edge Channels and/or Angles and Bent Steel Plates - Section 05 50 00.
 4. Gypsum Wallboard Framing Construction - Section 09 29 00.
 5. Loading Dock Equipment - Section 11 13 00.
 6. Embedded Items and Sleeves - Specified under Division 22 and Division 26.

1.02 REFERENCE SPECIFICATIONS

- A. Except as otherwise shown or specified herein, design of Work, materials, and workmanship shall conform to the following current specifications and standards as referred to herein.

- B. American Concrete Institute (ACI) publications, and related ASTM International Standard Specifications referenced therein.
 - 1. SP-15 ACI Field Reference Manual: Standard Specifications for Structural Concrete ACI 301 w/Selected ACI Reference.
 - 2. SP-66 ACI Detailing Manual (formerly ACI 315).
 - 3. ACI 302.1R - Guide for Concrete Floor and Slab Construction.
 - 4. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
 - 5. ACI 305R – Guide to Hot Weather Concreting.
 - 6. ACI 306R – Guide to Cold Weather Concreting.
 - 7. ACI 308R - Guide to Curing Concrete.
 - 8. ACI 318 - Building Code Requirements for Structural Concrete (Chapters 3-7).
 - 9. ACI 347 - Guide to Formwork for Concrete.
- C. ASTM International Standard Specifications, as referred to herein.

1.03 SITE INFORMATION

- A. Site Examination: Contractor shall examine the site to ascertain the state thereof and understand the complexities of the Work. Compare the site with the Drawings, condition of the premises, actual elevations, existing obstructions, areas of Work and other conditions that would affect the completion of the Work.
- B. Soils Investigation Report: Refer to Specification Section 02 32 00 - Soil Investigation Reports included as part of the Project Manual.

1.04 QUALITY ASSURANCE

- A. General: Provide all labor, equipment, technical services, and materials to produce, place and finish concrete free from defects. Any concrete failing to meet any of the requirements of these Specifications will be rejected. Contractor shall, at his expense, remove all rejected concrete from the premises, (including other materials or Work damaged in the removing) and replace with concrete complying with the Specifications, also replacing all other material and Work affected.
- B. Engineered Cement Products:
 - 1. Installer: Firm shall have a minimum of (5) years successful experience, regularly engaged in installation of specified materials, properly equipped and acceptable to manufacturer.

1.05 SUBMITTALS

- A. General: Submit Shop Drawings, Product Data, Material Submittals, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Shop Drawings: Submit complete Shop Drawings for all reinforcing steel, including bar bends, hooks, and lap splice dimensions.

- C. Laboratory Test Reports: Submit test data for concrete materials and concrete mix designs, including admixture data sheets, not less than fourteen (14) days before scheduled concrete placement.
 - 1. Test Data: Provide for each concrete mix design; test data showing that the 28 day strength meets the required design specifications.
 - 2. Floor Slab Mix Design: Exposed concrete floor slabs not to be subsequently covered by other finish materials shall not have fly ash in the floor slab mix. Fly ash is prohibited in the floor slab mix design in order to prevent any discoloration of the exposed concrete.
- D. Product Data:
 - 1. Miscellaneous Materials/Products: Provide manufacturer's Data Sheets on each product to be used, including the following:
 - a. Preparation instructions and recommendations.
 - b. Storage and handling requirements and recommendations.
 - c. Installation methods.
- E. Material Approvals: Unless otherwise required by the Architect, material shall not be ordered, delivered, fabricated or installed until Contractor has received approval from the Architect.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Material Shelf Life: Do not retain material at the jobsite which has exceeded the shelf life recommended by the manufacturer.

1.07 PRECONSTRUCTION CONFERENCE

- A. Floor Slab Construction and Finishing: Before starting Work, arrange a job-site meeting with representatives of the General Contractor, Owner and the Architect to discuss procedures for satisfactory concrete operations, Specifications, and any questions pertaining to the Concrete Floor Slab Work.
- B. Preconstruction Meeting: A preconstruction meeting regarding floor slab construction may be necessary to verify floor tolerance flatness and levelness required and to make sure that all participants understand the use and implications of floor flatness and levelness testing. The purpose of the meeting is to clarify requirements, to agree to a testing plan, timing of measurements and reporting, and evaluation of test results. This meeting shall also be used to address actions to be taken if the slab does not meet flatness or levelness specifications. Discussion shall address the range of remedial actions to possibly include grinding, topping coats, and financial credits.

1.08 WARRANTY

- A. Form of Warranty: Execute a warranty, in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the period specified, and any damage to other Work caused by such imperfections or by the repairing of same. The period for all Work shall be for not less than one (1) year from date of Owner's acceptance of the installation.

PART 2 - PRODUCTS

2.01 CONCRETE DESIGN

- A. General: All concrete, unless otherwise specified, shall consist of Portland Cement, coarse aggregate, fine aggregate and water.
- B. Types of Concrete: Refer to Structural Drawings.
- C. AE Concrete: Air-entrained concrete shall be made with Type III (High Early Strength) cement shall have 28 day strength in 7 days. Air content for air-entrained exterior concrete shall be 6%, plus or minus 1%. All interior slabs subject to abrasion shall have a maximum air content of 3%.
- D. Concrete Strengths and Locations:
 - 1. AE4000 p.s.i. Concrete: Sidewalks and exterior Work.
 - 2. 4000 p.s.i. Concrete: Interior concrete floor slabs as indicated on Drawings.
 - 3. 2500 p.s.i. Concrete: Steel Pipe Guard Posts (concrete fill).
 - 4. 1500 p.s.i. Concrete: Concrete fill.

2.02 GRANULAR FILL SUBBASE

- A. Provide granular fill subbase as indicated on the Drawings for slabs on ground within building lines, and for exterior concrete sidewalks immediately adjacent to the building. Granular fill as specified herein shall be clean natural sand, manufactured sand, or a combination thereof, subject to the approval of Soils Engineer. Sand shall be compacted to proper density and minimum thickness as shown on the Drawings.
 - 1. Provide clean, fine-graded material with at least 10 to 30% of particles passing a No. 100 (150µm) sieve but not contaminated with clay, silt, or organic material.
 - 2. Material shall have a uniform distribution of particle sizes ranging from No. 4 (4.75 mm) to the No. 200 (75 µm) sieve. Contractor shall refer to ASTM Standard C33, Table 1, for limitation of deleterious material finer than No. 200 (75 µm) sieve. Unwashed size No. 10 (2 mm) per ASTM Standard D448 is also acceptable.

2.03 CONCRETE MATERIALS

- A. Cement: Standard brand of Portland Cement conforming to ASTM C150 - Standard Specification for Portland Cement, for Types I or III. Cement shall be kept dry at all times and only one brand shall be used for Concrete Work in any one section of the Project.
- B. Aggregate: Coarse and fine aggregate conforming to ASTM C33 - Standard Specification for Concrete Aggregates; requirements for hardness, durability, purity, gradations.
 - 1. Coarse Aggregate: Gravel or dolomite stone (compact limestone or marble rich in magnesium carbonate) of the following sizes; walls, 1-1/2" to No. 4; slabs and thin sections, 3/4" to No. 4; elsewhere 1" to No. 4. Mixed and unwashed aggregate shall not be used in the Work. For slabs 3 inches thick, or less, use a pea gravel coarse aggregate.

TABLE 1 - AGGREGATE SIZE

NOMINAL AGGREGATE SIZE	MSDH ASTM C33	REFERENCE	SIEVE SIZE				(PASSING BY WEIGHT)		
			2"	1-1/2"	1"	3/4"	1/2"	3/8"	#4
1-1/2"	467	None	100 ----	95 to 100	----	35 to 70	----	10 to 30	0 to 5
1"	57	6	----	100	95 to 100	-----	25 to 60	----	0 to 5
3/4"	67	17	----	----	100	90 to 100	----	20 to 55	0 to 10

2. Fine Aggregate: Clean, hard, durable, uncoated grains of natural sand, free from silt, loam, and clay. Range in the following sizes by percentage of weight:

Passing	3/8"	Sieve:	100%
Passing No.	4	Sieve:	95% - 100%
Passing No.	8	Sieve:	65% - 95%
Passing No.	16	Sieve:	35% - 75%
Passing No.	30	Sieve:	20% - 55%
Passing No.	50	Sieve:	15% - 30%
Passing No.	100	Sieve:	0% - 10%
- C. Mixing Water: Potable water (suitable for drinking) shall be clean, free from oils, alkalies, acids, organic water, or other deleterious materials.
- D. Admixtures:
 1. Air-Entraining Admixtures: Concrete required to be air-entrained shall contain an air-entraining admixture approved by the Architect/Engineer and shall conform to ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
 2. Prohibited Admixtures:
 - a. Do not use calcium chloride, or other similar additives containing salts.
 - b. Do not use chemical admixtures that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
 3. Other Admixtures: All other admixtures, to retard or accelerate setting, to reduce water ratio, or to prevent freezing shall conform to ASTM C494 - Standard Specification for Chemical Admixtures for Concrete; shall have long term test data proving its non-corrosive effect on reinforcing steel; and shall not be used without prior written approval from the Owner's Supervising Engineer.

2.04 REINFORCING STEEL

- A. General: All reinforcement shall be cleaned of all mill or excessive rust scale and shall be free from all coatings that will destroy or reduce its bond.
- B. Welded Wire Reinforcing: Conforming to ASTM A185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

- C. Reinforcing Steel Bars: 3/8" and larger, shall be deformed bars conforming to ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement, including Supplementary Requirement S1, Grade 60.
- D. Epoxy-Coated Reinforcing Bars: Where required by Drawings, provide steel bars conforming to ASTM A775 - Standard Specification for Epoxy - Coated Steel Reinforcing Bars.
- E. Reinforcement Supports and Accessories: For proper placing, spacing, supporting, and fastening reinforcement in place, provide all chairs, bolsters, ties, tie wires (annealed, minimum 16 gauge), bar supports, spacers; sized and shaped for adequate support of reinforcement during concrete placement. Include all other accessories and devices necessary or required to fully complete the Work. Hooking of wire mesh will be grounds for rejection of the installation.

2.05 FORMS

- A. General: Furnish all forms wherever necessary to confine the concrete and shape to the required dimensions. Forms shall have sufficient strength to withstand pressures resulting from placement and vibration of the concrete and shall have sufficient rigidity to maintain specified tolerances.
- B. Design: Formwork shall be designed for the loads, lateral pressure, and allowable stresses outlined in Chapter 2 - Design, of ACI 347, and for design consideration and requirements of the local building code.
- C. Form Release Coating:
 - 1. Products and Manufacturers: Concrete form release coating shall be one of the following products, or other comparable equivalent approved non-staining release agent guaranteed against interference with bonding of finish materials.
 - a. Product and Manufacturer: Euco Super - Slip, as manufactured by The Euclid Chemical Company, 19218 Redwood Road, Cleveland, OH 44110, (216)531-9222 or (800)321-7628; www.euclidchemical.com.
 - b. Product and Manufacturer: Nox-Crete Form Coating, as manufactured by Nox-Crete Products Group, 1444 S. 20th Street., Omaha, NE 68108, (402)341-1976 or (800)669-2738; www.nox-crete.com.
 - c. Product and Manufacturer: DUOGARD®, as manufactured by W.R. Meadows, Inc., 300 Industrial Drive, P.O. Box 338, Hampshire, IL 60140-0338, (800)342-5976 or (847)214-2100; www.wrmeadows.com.

2.06 MISCELLANEOUS MATERIALS

- A. Vapor Barrier: Vapor barrier material shall be not less than ten (10) mils thick and be waterproof and resistant to deterioration. Vapor barrier shall conform to ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; Class A. Water vapor permeance rating of the vapor barrier shall be less than 0.01 perms as tested in accordance with ASTM Standard E1745, Section 7.
 - 1. Tensile Strength and Puncture Resistance Requirements for Class A Vapor Barrier:
 - a. Tensile Strength: 45 lbf/in.
 - b. Puncture Resistance: 2200 grams.

2. Seam Tape for Vapor Barrier: Seam tape used must be the tape provided by the manufacturer of the corresponding vapor barrier being used.
- B. Expansion Joint Filler: Fiber conforming with ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); Type I, 1/2" thick x full depth of slab for interior slabs. At exterior slabs, depth shall be 1" less than full slab depth.
- C. Joint Sealant: Horizontal concrete moving joints (i.e. at floor slabs, sidewalks) shall be sealed with the following manufacturer's product.
1. Manufacturer: Tremco, Incorporated, Commercial Sealants & Waterproofing Division, 3735 Green Road, Beachwood, OH 44122, (800)321-7906 or (216)292-5000; www.tremcosealants.com.
 2. Product: Vulkem® 45SSL, one-part moisture-curing, pourable grade semi-self-leveling, polyurethane joint sealant, meeting the requirements of ASTM C920 - Standard Specification for Elastomeric Joint Sealants; Type S, Grade P, Class 35. Verify color with Architect, where color of joint is required to match adjacent materials other than concrete.
- D. Moisture-Retaining Cover: Provide material as specified herein in accordance with ASTM C171 – Standard Specification for Sheet Materials for Curing Concrete. Material shall be in sheet form for use in covering the surfaces of hydraulic cement concrete to inhibit moisture loss during the curing period. The following types are acceptable.
1. Curing Paper: Regular or White.
 2. Polyethylene Film: Clear or White Opaque.
 3. Other: White-Burlap-Polyethylene Sheet.
- E. Exterior/Interior - Curing and Sealing Compound: Liquid type membrane forming curing compound, suitable for exterior and interior concrete surfaces, and complying with ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; Type 1, Class A. Products subject to compliance with requirements. Provide curing and sealing compound by one of the following manufacturers:
1. The Euclid Chemical Company, 19218 Redwood Road, Cleveland, OH 44110, (216)531-9222 or (800)321-7628; www.euclidchemical.com, "Eucocure VOX".
 2. BASF Construction Chemicals, LLC - Building Systems, 889 Valley Park Drive, Shakopee, MN 55379, (800)433-9517; www.BuildingSystems.BASF.com, "Sonneborn®, Kure-N-Seal™".
- F. Chemical Hardener: Surface applied colorless water-based solution containing a blend of magnesium fluosilicate and zinc fluosilicate combined with a wetting agent, containing not less than 2 lbs. of fluosilicates per gallon. Provide chemical hardener by one of the following manufacturers:
1. The Euclid Chemical Company, 19218 Redwood Road, Cleveland, OH 44110, (216)531-9222 or (800)321-7628; www.euclidchemical.com, "SURFHARD".
 2. BASF Construction Chemicals, LLC - Building Systems, 889 Valley Park Drive, Shakopee, MN 55379, (800)433-9517; www.BuildingSystems.BASF.com, "Sonneborn®, Lapidolith®".
 3. Nox-Crete Products Group, 1444 S. 20th Street, Omaha, NE 68108, (800)669-2738 or (402)341-1976; www.nox-crete.com, "Harbeton".

- G. Terminal Building - Dock Area - Curing and Sealing Compound: Ready to use, 30% solids concrete curing and sealing compound, VOCOMP-30 manufactured by W. R. Meadows, Inc., P.O. Box 338, Hampshire, IL 60140-0338, (847)214-2100, www.wrmeadows.com.
- H. Fuel Island - Hardener and Densifier: Amorphous colloidal silica solution, water based, H&C Clear Liquid Hardener & Densifier as manufactured by H&C Products Group, 101 W. Prospect Ave., Cleveland, OH 44115, (800)867-8246, www.hc-concrete.com.
- I. Maintenance Building Trailer Lane and Safety Lane and Truck Wash - Wash Bay - Water and Oil Repellent: Modified “neat” Silane Water and Oil Repellency System, Consolideck SLX100 Water & Oil Repellent as manufactured by Prosoco, Inc., 3741 Greenway Circle, Lawrence, KS 66046, (800)255-4255, www.prosoco.com.
- J. Bonding Compound: Bonding agent for concrete shall be “Euco-Weld” as manufactured by The Euclid Chemical Company, 19218 Redwood Road, Cleveland, OH 44110, (216)531-9222 or (800)321-7628; www.euclidchemical.com. Product shall comply with ASTM C1059 - Standard Specification for Latex Agents for Bonding Fresh To Hardened Concrete.

PART 3 - EXECUTION

3.01 FORMWORK

- A. Furnish and erect to shapes, elevations and dimensions shown, all forms for Concrete Work.
- B. Forms for Concrete Work shall be constructed to prevent leakage, amply strong, rigidly stayed, braced to prevent bulging or deflection under the weight of liquid concrete and designed for removal that will not damage the surfaces.
- C. Forms may be removed as soon as the concrete will safely bear its own weight and any superimposed loads. Contractor shall be responsible for early removal.
- D. Pointing of any concrete surface will not be permitted until the Work has been examined by the General Contractor and permission given.
- E. Formwork for exposed walls, bulkheads and other construction shown on the Drawings shall be carefully constructed with plywood or other suitable materials with as few joints as possible to give “smooth, true and unbroken concrete surfaces”. All wall surfaces shall receive a hand-rubbed finish.

3.02 APPLICATION OF FORM RELEASE AGENT

- A. General: Apply form release agent to all contact surfaces prior to placement of concrete.
- B. Application: Apply form release agent on formwork in accordance with manufacturer’s instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.
- C. Prohibited Use of Form Release Agent:
 - 1. Special Concrete Finishes: Do not apply form release agent where concrete surfaces are scheduled to receive special finishes which may be affected by agent. Soak contact surfaces of untreated forms with clean water. Keep surfaces wet prior to placing concrete.
 - 2. Wood Grain Finish Surfaces: Do not apply form release agent where wood graining characteristics are required on finished concrete surfaces. Leave form work dry.

3.03 PLACING REINFORCING STEEL

- A. Reinforcing steel shall be installed in accordance with submitted Shop Drawings as approved, the “Manual of Standard Practice of the Concrete Reinforcing Steel Institute (CRSI)”, and the governing building authority.
- B. Welded wire fabric reinforcement in slabs over earth shall be supported on spacers or other approved means to remain in top 1/3 of slab below finished surface, with end and side laps wired together.

3.04 TRANSIT MIXED CONCRETE

- A. General: Ready-mixed concrete shall be batched, mixed, and transported in accordance with ASTM C94 - Standard Specification for Ready-Mixed Concrete, and aggregate for the concrete shall comply with the requirements of ASTM C33 - Standard Specification for Concrete Aggregates.
- B. Concrete and Plant Certification: All transit mixed concrete shall be secured from a reputable, established, local supplier, who employs the use of accurate measuring devices, modern plant and equipment, conforming to the “Plant Certification Check List for Certification of Ready Mixed Concrete Production Facilities of the National Ready Mixed Concrete Association (NRMCA)”, and is approved by the Architect.
- C. Delivery of Concrete: With each delivery of concrete to the Project site, the Contractor shall furnish the Owner’s Representative with a copy of the delivery ticket containing the following information:
 - 1. Name of ready-mix batch plant.
 - 2. Serial number of ticket.
 - 3. Date.
 - 4. Truck Number.
 - 5. Name of Purchaser.
 - 6. Name and location of job.
 - 7. Class or designation of concrete coinciding with an approved mix design.
 - 8. Amount of concrete in cubic yards.
 - 9. Time loaded or first mixing of cement and aggregate.
 - 10. Water added by receiver of concrete, and initials.
 - 11. Reading of revolution counter at first addition of water.
 - 12. Type, brand, and amount of cement.
 - 13. Type, brand, and amount of admixtures.
 - 14. Information to calculate total mixing water added by producer.
 - 15. Maximum size of aggregate.
 - 16. Weight of fine and coarse aggregate.
 - 17. Previously approved ingredients.
 - 18. Signature of redi-mix representative.

- 19. Time of day.
- 20. Ambient temperature.
- 21. Location and intended use of concrete batch.

3.05 CONCRETE TESTING

- A. In accordance with requirements specified in Section 01 45 23 - Testing and Inspecting Services, the Owner will engage the services of an approved, unbiased, Independent Testing Laboratory to make test cylinders and to determine the quality of all concrete and will pay all costs incurred therefrom. The laboratory shall issue copies of all reports as outlined in Section 01 45 23.
- B. Four (4) test cylinders shall be made from a sample taken from each continuous pour, or from each 150 cubic yards, or fraction thereof, whichever is lesser, of each class of concrete placed each day. One (1) cylinder shall be field cured similar to concrete placed, and three (3) shall be cured in accordance with ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
- C. One (1) cylinder shall be tested at seven (7) days for strength information, and two (2) cylinders shall be tested at twenty-eight (28) days for acceptance.
- D. Specimens tested at seven (7) days shall show not less than 2/3 of the twenty-eight (28) day designed strength, and twenty-eight (28) day tested specimens shall show not less than 100% of the twenty-eight (28) day designed strength.
- E. The strength level of the concrete will be considered satisfactory so long as the averages of all sets of three (3) consecutive strength test results equal or exceed the specified strength f'_c , and no individual strength test shall be more than 500 p.s.i. under the specified strength.
- F. Slump tests shall be conducted in accordance with ASTM C143 - Standard Test Method for Slump of Hydraulic - Cement Concrete.

3.06 COLD WEATHER AND HOT WEATHER REQUIREMENTS

- A. If concrete is placed when temperature is 40°F., or lower, all aggregate and mixing water shall be heated so that concrete when placed in the forms shall have a temperature of not less than 60°F., or more than 80°F.
- B. All concrete shall be adequately protected after placing to prevent damage from freezing, by the use of suitable covers and adequate heating equipment. Methods and extent of protection shall meet the approval of the Owner's Representative who shall have authority to order additional protection if necessary. Frozen and damaged concrete shall be removed and replaced at the Contractor's expense, to the satisfaction of the Architect.
- C. All cold weather concreting shall conform with requirements and recommendations of referenced standard ACI 306R – Guide to Cold Weather Concreting.
- D. All hot weather concreting shall conform with requirements and recommendations of referenced standard ACI 305R – Guide to Hot Weather Concreting.

3.07 PLACING CONCRETE

- A. Prior to placing concrete, water, ice, snow, and debris shall be removed from the excavation.

- B. Mixing and conveying equipment shall have hardened concrete and other foreign materials removed from inner surfaces before beginning a run of concrete.
- C. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable, by methods which will prevent the separation or loss of the ingredients. Deposit as near as possible to final position to avoid rehandling.
- D. Do not free drop concrete more than 48". Provide suitable and approved placing equipment such as elephant trunks and tremies or provide openings in sides of forms as required to limit free dropping to the above requirement. At areas where meeting this requirement is not possible, submit method of minimizing free drops, including distance of free drop, to Architect for approval.
- E. Concrete during and immediately after depositing shall be thoroughly consolidated by means of suitable tools. Concrete shall be thoroughly worked around the reinforcement and into the corners of the form. Vibrating of concrete shall be done by skilled personnel.
- F. When placing concrete against previously placed Concrete Work, thoroughly clean, roughen, and dampen the surfaces, and apply approved "bonding compound" as specified herein. Apply bonding compound in accordance with manufacturer's recommendations. Place new concrete after the bonding compound has dried.
- G. Water accumulating during placing shall be removed before additional concrete is placed.
- H. Set and build-in all materials, such as anchor bolts, sleeves, and angles furnished by other Contractors.
- I. Provide 3" minimum concrete cover protection for reinforcing steel when foundation is cast against or in contact with the earth.

3.08 CONCRETE SLABS ON GROUND

- A. Concrete floors on ground or fill shall not be laid until all underfloor construction, including mechanical and electrical utilities are installed complete, backfilled, inspected and approved by the General Contractor. Furnish, place, and compact to 95% ultimate density as determined per the Modified Proctor Test, sand fill subbase of not less than 4" depth (compacted thickness) as indicated and unless otherwise as noted on the Drawings, and fine grade to (plus/minus) 1/10 of a foot under flat concrete slabs.
 - 1. Furnishing, placing, and compacting of additional subgrade fills under slabs shall be by this Contractor.
 - 2. Examine the condition of subgrade fills provided by others, to verify proper compaction and condition of unexcavated areas.
 - 3. Do not place sand fill subbase over a frozen subgrade or a subgrade covered with ice, snow, or water.
- B. Vapor Barrier/Retarder: Underlay interior concrete floor slab on ground/grade with a layer of vapor barrier material as specified herein. Locate the vapor barrier directly beneath the slab as described in ACI 302.1R-04. Install vapor barrier and seam tape in accordance with ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs and manufacturer's written instructions. Overlap all seams between sheets a minimum of 6" and tape seal all seams and penetrations vapor tight with manufacturer's recommended tape. Lap sheets 8" onto adjacent vertical surfaces and seal vapor barrier tight to the wall or slab itself. DO NOT PUNCTURE FILM DURING CONSTRUCTION OPERATIONS. Inspect prior to the pour and repair any damaged vapor barrier/retarder, including all tears or holes before covering.

1. Place vapor barrier material sheets with longest dimension parallel with direction of pour.
 2. Apply seam tape to a clean and dry vapor barrier.
 3. Seal all penetrations (including pipes) per manufacturer's instructions.
- C. Concrete slabs on ground shall be of thickness as noted on the Drawings, (on the vapor barrier for interior floor slabs), over compacted granular fills. All slabs shall be reinforced with 6" x 6" welded wire reinforcing, wire thickness as noted on the Drawings.
- D. Provide expansion and construction joints where indicated and as required for good construction. Keep construction joints to a minimum and where constructed, coincide with column centerline. Depth of concrete along edge of construction joints shall be thickened to 6" minimum.
- E. Pitch floors to drain where so indicated or required by field conditions.
- F. Unsatisfactory concrete floors and sidewalks shall be remedied by grinding or by other methods approved by the Architect at the Contractor's expense.
- G. Thicken slabs under all bearing partitions, and elsewhere as indicated on the Drawings.
- H. Isolate all columns as shown. Place "diamonds" after completion of floor slabs. Finish "diamonds" same as adjacent slabs.
- I. Floor Tolerance Flatness and Levelness: Concrete floor slabs shall comply with ASTM E1155-Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers; and shall be constructed with the minimum Floor Flatness and Floor Levelness values as specified herein.
1. Using the F-Number: Contractor shall utilize the following chart to provide the relative values of the F_F and F_L numbers required for this Project as they apply to the various situations for slabs on ground. Values specified are taken from ACI 302.1R.

F _F	F _L	Approx. Gap Below a 10-Foot Straight Edge Equivalent for F _F	Slab Type
20	15	5/16 in.	Non-critical areas such as Mechanical Rooms and surfaces to have thick setting bed tile.
25	20	1/4 in.	Carpeted areas.
35	25	1/8 in.	Thin-set tile, VCT, or vinyl sheet flooring with moderate or heavy traffic

- J. Where floor surfaces are to receive resilient flooring, all defects of sufficient magnitude to show through floor covering shall be removed by grinding.

3.09 CONCRETE FINISHES

- A. Trowel Finish: Apply trowel finish to monolithic slab surfaces that are to be exposed-to-view, and slab surfaces to be covered with finish materials such as resilient flooring, ceramic, porcelain or quarry tile, carpet, paint or other thin film finish coating system. Do not trowel surfaces depressed to receive clay tile or topping.
- B. Trowel and Fine Broom Finish: Where ceramic, porcelain or quarry tile is to be installed with thin set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.
- C. Non-Slip Broom Finish: Apply non-slip finish to exterior sidewalks, ramps, and as indicated on the Drawings and specified herein.

1. Sidewalks: Light broom finish.
 2. Ramps: Coarse broom finish.
 3. Accessible Routes at Ramps: Coarse broom finish transverse to slope.
- D. Faces of Concrete Walls: Exposed concrete surfaces shall not have any visible aggregate or formwork marks. Remove projections and offsets, saturate with clear water all form tie holes, honeycombed areas and damaged surfaces, and fill voids with grout. Cut out stove pockets down to solid concrete, wet down, and fill with grout. Mix grout, for filling voids, as dry as possible, with just enough water so that it will tightly compact when forced into place.

3.10 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures and mechanical injury. In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations.
- B. Moist Curing: Concrete slabs designated to receive finish materials such as Pavers, Concrete Floor Topping, Ceramic or Porcelain Tile, Resilient Flooring, or Stain Floor Finish shall be kept moist for a period of not less than seven (7) days with a moisture-retaining cover as specified herein, applied with lapped and sealed joints.
- C. Exposed Concrete Slabs: Concrete slabs not to be subsequently covered by other finish materials shall receive specified curing and sealing compounds applied to exposed concrete slabs as soon as final finishing operations are complete, in strict accordance with manufacturer's directions.
- D. Protection: Protect all concrete from mechanical damage and the weather. If paper or membrane coating is used, protect the concrete with planking or similar approved manner in areas of traffic.

3.11 SEALER AND DUSTPROOFER

- A. Exterior/Interior - Curing and Sealing Compound Applications: Apply as required; two (2) coats of specified curing and sealing compound in accordance with the manufacturer's specifications.

3.12 CHEMICAL HARDENER FINISH

- A. Apply chemical-hardener finish to interior concrete floors. Apply liquid chemical-hardener after complete curing and drying of the concrete surface.
- B. Apply chemical hardeners, in accordance with manufacturer's printed instructions.
- C. After final coat of chemical-hardener solution is applied and dried, remove surplus hardener by scrubbing and mopping with water.

3.13 EXPANSION JOINTS AND JOINT SEALING

- A. Expansion joint material shall be of thicknesses noted on Drawings; and extend full depth of slabs, except in exterior Work and interior monolithically finished slabs, the joint material shall be held down 1" below top surfaces.
- B. Construct expansion joints at perimeter of floor slabs, where slabs abut concrete and/or masonry walls, with approved expansion joint material, 1/2" thick x full depth of slab.
- C. Fill the void left at the top of expansion joints, at the top of construction joints, and at the top of plane and weakness joints, with approved joint sealant.

3.14 EXTERIOR CONCRETE SLABS AND SIDEWALKS

- A. General: Furnish and install all exterior concrete slabs, sidewalks, ramps, curbs, where shown on the Drawings. Furnish, place, and compact to unyielding base, sand fill subbase of 4" depth, unless otherwise as noted on the Drawings, and fine grade to (plus/minus) 1/10 of a foot under concrete walk slabs.
- B. Exterior Concrete: All exterior concrete shall be air-entrained, with reinforcing and thickness indicated on the Drawings.
- C. Finishes: For finishes, refer to Article "CONCRETE FINISHES" specified herein.
- D. Expansion Joints: Provide 1/2" thick expansion joints installed at 28 feet centers, unless otherwise shown on the Drawings, as required and normal to good building practices.
- E. Exposed Edges and Expansion Joints: Provide rounded edges with a 1/4" radius edging tool, unless otherwise indicated on the Drawings.

3.15 MISCELLANEOUS CONCRETE WORK

- A. Furnish and install any and all miscellaneous Concrete Work necessary to fully complete the Work shown or required.

3.16 SPECIAL ITEMS

- A. The following special items specified herein are included only as a convenience to the Contractor, all Work noted or required by Contract Documents shall be completed.
 - 1. Steel Pipe Guard Posts: Set and install steel pipe guard posts at locations indicated on the Drawings. Fill guard posts with 2500 p.s.i. concrete, and form concrete to rounded cap. (Steel pipe posts shall be furnished by the Miscellaneous Metal Work Contractor.)
 - 2. Loading Dock Steel Edges: Set and install channels, angles, plates and anchors as detailed on the Drawings. (Channels, angles, plates, and anchors shall be furnished by the Miscellaneous Metal Contractor.)

3.17 REPAIRING, PATCHING, GRINDING

- A. Patch cracks, rock pockets, honeycombs, and holes resulting from the removal of the nail, rod and cone ties, separators, and core samples.
- B. Concrete having floor defects of sufficient magnitude and subject to "read through" floor covering shall be remedied by grinding or replacement of slab. Latex underlayment will not be permitted.

3.18 PROTECTION AND CLEANING

- A. All exposed concrete surfaces shall be protected during construction. At the completion of the building(s), all exposed Concrete Work shall be thoroughly broom cleaned and washed by this Contractor.

END OF SECTION

SECTION 03 35 00CONCRETE FINISHING

The requirements of the “General Conditions”, “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, equipment, apparatus, tools, transportation, protection and services necessary for, and reasonably incidental to the proper execution and completion of all Concrete Finishing Work, as indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:

1. Polished Concrete Flooring System.

- B. Summary:

1. Work of this section includes polished concrete finish in accordance with cast-in-place concrete characteristic and applying sealer and hardener, and polishing concrete to provide finish level as specified in this specification.

- a. Hardened or Existing Concrete Properties:

- 1) Minimum Concrete Compressive Strength: 3000 psi.
- 2) Normal Weight Concrete: No lightweight aggregate.
- 3) Non-air entrained.

- b. Placement Properties:

- 1) Natural concrete slump of 4-1/2 inches - 5 inches.
- 2) Concrete admixtures may be used if necessary.

- c. Flatness Requirements:

- 1) Overall F_F 40.
- 2) Local F_F 30.
- 3) Use ASTM E1155 - Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers, using the F number system.

2. Hard-Steel Troweled Finished Concrete with no burn marks finish to ACI 302.1R for Class 5 floor.
3. Concrete must be cured a minimum of 28 days prior to polishing.

- C. Color Selections: Refer to the Drawings and as specified herein.

- D. Room Finish Schedule: Refer to the Drawings.
- E. Related Sections: The following related Work will be provided under other sections of the Specifications:
 - 1. Cast-In-Place Concrete - Section 03 30 00.

1.02 SUBMITTALS AND QUALITY ASSURANCE

- A. General:
 - 1. Submit Product Data, Installer Qualifications, Test Reports, Design Mixes and Cylinder Break Certifications, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
 - 2. All materials shall be of type and quality specified herein, and shall be subject to the Architect's and Owner's review. Methods of preparation and installation shall be in accordance with manufacturer's printed specifications, and as directed by the Owner's Representative.
- B. Product Data: Submit manufacturer's technical literature for each product indicated, specified or required. Include manufacturer's technical data, application instructions, recommendations and Material Safety Data Sheets (MSDS).
- C. Installer Qualifications: Provide data for company, principal personnel, experience and training. Provide a letter documenting installer's accreditation and certification compliance, as specified under quality assurance.
- D. Test Reports: Provide field quality control sheen gloss reading and static coefficient of friction test results conducted as specified and recorded on floor plan diagram confirming compliance with specified performance criteria.
- E. Design Mixes and Cylinder Break Certifications: Forward two (2) copies of design mixes and cylinder break certifications for each type of concrete to Architect for review at least fourteen (14) days preceding installation schedule.
- F. Samples:
 - 1. Submit two (2) 12-inch by 12-inch by 1-inch-thick samples demonstrating required H&C® products finish system using integral colored design mix proposed for finished Work.
 - 2. Samples will be approved by Architect, General Contractor and Owner (or Owner's Representative) for appearance, color, and texture.

1.03 FIELD MOCK-UP SAMPLES

- A. Mock-Up: Before performing the Work in this section, an on-site mock-up of the H&C products system application must be performed for representation of specified process, surface, finish, color and joint design/treatments must be installed for review and approval. Such mock-ups should be installed using the same Installer personnel who will perform Work. Approved mock-ups may become part of completed Work, if undisturbed at time of substantial completion.
- B. Mock-Up Size: 100 square foot sample panel at jobsite at location as directed under conditions similar to those which will exist during actual placement. Maintain sample panel exposed to view for duration of concrete Project installation.

- C. Mock-Up Requirements: If the Architect or Owner Representative determines that mock-ups do not meet requirements, demolish and remove them from the site and cast others until mock-ups are approved.

1.04 PROTECTION

- A. No satisfactory chemical or cleaning procedure is available to remove petroleum stains from the concrete surface as prevention is therefore essential.
 - 1. All hydraulic powered equipment must and shall be diapered to avoid staining of the concrete.
 - 2. No trade shall park vehicles on the inside slab. If necessary to complete their scope of Work, drop cloths shall be placed under vehicles at all times.
 - 3. No pipe cutting machine shall be used on the inside floor slab.
 - 4. Steel shall not be placed on interior slabs to avoid rust staining.
 - 5. Acids and acidic detergents shall not come into contact with slab.
 - 6. All trades shall be informed that the slab must be protected at all times.

1.05 PRE-INSTALLATION MEETING CONFERENCE

- A. Pre-installation Meetings: A pre-installation meeting shall be conducted to verify Project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.
 - 1. The following should be considered and reviewed:
 - a. Environmental conditions such as application temperatures, humidity, moisture, etc.
 - b. Scheduling and coordinating of other trades and phasing of Work.
 - c. Protection of adjacent and non-application areas and surfaces.
 - d. Disposal procedures of waste water from equipment.
 - e. Debris resulting from surface preparation and application process.
 - f. Repair of blemishes, voids, cracks, joints, defects and defective concrete substrate prior to polishing installation.
 - g. Steps of installation process of polished floor system and protective finish including color, liquid densifier, color (as-applicable) and protective finish.
 - h. Return-to-service requirements.
 - i. Maintenance schedule for post application service.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver only acceptable materials to the site in original containers, with seals unbroken, clearly labeled, bearing manufacturer labels indicating brand name and directions for storage. Material shall be checked by flooring contractor for completeness and shipping damage prior to start of Work.

- B. Storage: Store the materials at the site off the ground in properly protected dry storage facilities, until ready for use. Temperature of storage area shall be maintained between 50°F and 90°F. Damaged materials will not be acceptable, and shall be removed from the site. Do not store outdoors, in boiler rooms, compressor rooms, refrigerators, or near heating systems.
- C. Handling: Dispense special concrete finish material from factory numbered and sealed containers. Maintain record of container numbers.

1.07 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

PART 2 - PRODUCTS

2.01 MANUFACTURER AND MATERIALS

- A. Manufacturer: Polished Concrete Decorative Flooring System materials as specified herein shall be as manufactured for H&C® Concrete Products for The Sherwin-Williams Company, 101 Prospect Avenue, N.W., 10 Midland Building, Cleveland, OH 44115; www.hcconcrete.com.
- B. System Products:
 - 1. Hardening/Densifying Agent: H&C® Clear Hardener and Densifier.
 - a. Performance Criteria:
 - 1) Abrasion Resistance: ASTM Standard C779 - Up to 400% increase in abrasion resistance.
 - 2) Impact Strength: ASTM Standard C805 - Up to 21% increase impact strength.
 - 3) Ultra Violet Light and Water Spray: ASTM Standard G23-81 - No adverse effect to ultra violet and water spray.
 - 4) Reflectivity: Up to 30% increase in reflectivity.
 - b. Manufacturers Product Codes: H&C® Clear Hardener and Densifier, (55.030034-16/6502-97260 Gallons, 55.030035-20/6502-97278 Fives).
 - 2. Sealing Agent: H&C® Lithium Protective Finish.
 - a. Performance Criteria:
 - 1) Slip Resistance ASTM Standard D2047 Results: Greater than 0.6 Static Coefficient of Friction.
 - 2) Impact Strength: ASTM Standard C805 - Up to 21% increase impact strength.
 - b. Manufacturers Product Codes: H&C® Lithium Protective Finish, (6502-97906 Gallons, 55.030035-20/6502-97286 Fives).

PART 3 - EXECUTION3.01 SURFACE CONDITIONS

- A. Examine substrate, with installer present, for conditions affecting performance of finish. Correct conditions detrimental to timely and proper Work. Do not proceed until unsatisfactory conditions are corrected.
- B. Verify that base slab meet finish and surface profile requirements in Section 03 30 00 - Cast-In-Place Concrete, and Project Conditions.
- C. Prior to application, verify that floor surfaces are free of concrete and construction laitance.

3.02 APPLICATION

- A. The following H&C® Clear Liquid Hardener and Densifier process should be followed on all flooring areas of Project that is under scope of Work for a highly-polished or mirrored-polished finish:
- B. If a coating is to be removed, or dense substrate must be opened, a planetary machine must be used. A concrete hardness test, such as a Moh's test should indicate the level of abrasive need to begin the Project. Floors that need heavy-duty abrasive metal pads will initiate grinding with a 00-grit or 16-grit metal bond diamond pad prior to a 30-grit metal bond diamond pad. Most floors must minimally begin with a 30-grit metal bond diamond pad as outlined below. Continue the Project as follows:
 - 1. Grind floor using 50-grit metal bond diamond pads or approved equivalent.
 - 2. Scrub and rinse floor with clean water to remove grinding residue.
 - 3. Grind floor using 100-grit hybrid diamond pads or approved equivalent.
 - 4. Scrub and rinse floor with clean water to remove grinding residue.
 - 5. Grind floor using 100-grit resin diamond pads or approved equivalent.
 - 6. Scrub and rinse floor with clean water to remove grinding residue.
 - 7. Polish floor using 200-grit resin diamond pads or approved equivalent.
 - 8. Scrub and rinse floor with clean water to remove grinding residue.
 - 9. Apply H&C® Clear Hardener and Densifier to floor at 400-500 sq. ft. per gallon, allowing the product to saturate the floor for at least 20 minutes.
 - 10. After surface is completely dry, continue polishing process as outlined below.
 - 11. Polish floor using 400-grit resin diamond pads or approved equivalent.
 - 12. Scrub and rinse floor with clean water to remove grinding residue, if necessary.
 - 13. Polish floor using 1500-grit resin diamond pads or approved equivalent.
 - 14. Scrub and rinse floor with clean water to remove grinding residue, if necessary.
 - 15. Seal floor using H&C® Lithium Protective Finish.
 - 16. Burnish the floor between each coat with a hogs hair or black pad.
 - 17. Proper densification should be checked by General Contractor, Owner, or Owner's Representative prior to application protective finish step.

3.03 PROTECTIVE FINISH APPLICATION

A. Sealing, Hardening and Polishing of Concrete Surface:

1. Application is to take place at least 10 days prior to racking and other in-store accessory installation, thus providing a complete, uninhibited concrete slab for application.
2. Only a certified applicator shall apply H&C® Lithium Protective Finish. Applicable procedures must be followed as recommended by the product manufacturer and as required to match approved test sample.
3. Seal floor using H&C® Lithium Protective Finish. Apply two (2) coats at a rate of 2500 square feet per gallon, using a Hudson sprayer and a microfiber applicator.
4. Burnish the floor between each coat with a hogs hair or black pad. Burnish to required sheen level.
5. Achieve waterproofing, hardening, dust proofing, and abrasion resistance of the surface without changing the natural appearance of the concrete, except for the sheen.

3.04 WORKMANSHIP AND CLEANING

- A. The premises shall be kept clean and free of debris at all times.
- B. Remove spatter from adjoin surfaces, as necessary.
- C. Repair damages to surface caused by cleaning operations.
- D. Remove debris from jobsite.
 1. Dispose of materials in separate, closed containers in accordance with local regulations.

3.05 PROTECTION

- A. Protect finished Work until fully cured in accordance with manufacturer's recommendations.

3.06 DAMAGED WORK

- A. All damaged or defective Work shall be replaced by new Work, to the satisfaction of the Architect and/or Owner, at no cost to the Owner. Work which becomes damaged during replacing Work shall be replaced by Flooring Contractor.

3.07 CLEAN-UP

- A. Work Required: Clean-up Work soiled in the performance of Concrete Finishing Work.
- B. Debris and Waste Materials: During progress of the Work, the premises shall be kept free of all debris and waste materials resulting from the Work of this section. All debris and rubbish shall be removed from the site. Upon completion, and before final acceptance of the Work, all debris, rubbish, unused materials, tools, and equipment shall be removed from the site.

END OF SECTION

SECTION 03 41 13STRUCTURAL PRECAST CONCRETE

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Furnish all labor, materials, equipment, delivery and erection of all Precast Prestressed Concrete Work, complete with accessories and incidental Work, as specified herein and shown on the Drawings.
- B. Related Sections: The following items of related Work will be provided for under other sections of the Specifications as indicated:
 - 1. Masonry Work - Section 04 20 00.
 - 2. Roofing System - Section 07 53 23.
 - 3. Cutting Openings Through Precast Slabs - By Contractors of other trades as required.

1.02 APPLICABLE STANDARDS

- A. Codes and Reference Specifications: Unless otherwise specified herein, materials and workmanship shall conform to the following current codes and specifications.
 - 1. All applicable Local Building Codes and Ordinances.
 - 2. ACI 301 - Specifications for Structural Concrete for Buildings.
 - 3. ACI 315 - Details and Detailing of Concrete Reinforcement.
 - 4. ACI 318 - Building Code Requirements for Structural Concrete.
 - 5. American Welding Society (AWS), D1.1, Structural Welding Code - Steel.
 - 6. Prestressed Concrete Institute's MNL 116, “Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products”.
 - 7. PCI Design Handbook - Precast and Prestressed Concrete, Fifth Addition.

1.03 QUALITY ASSURANCE

- A. Design Basis: American Concrete Institute “ACI 318 - Building Code Requirements for Structural Concrete” and PCI Design Handbook, Second Edition.
- B. Manufacturing and Testing: Comply with Prestressed Concrete Institute's “Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products (PCI MNL-116)”.

C. Erector Qualifications:

1. An erector with a minimum of 2 years of experience who has completed structural precast concrete work similar in material, design and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance and who meets the following requirements.
 - a. Retains a PCI Certified Field Auditor, at erector's expense, to conduct a field audit of a project in the same category as this Project prior to start of erection. Submits Erectors Post Audit Declaration.
 - b. The basis of the audit is the "PCI Erector's Manual - Standards and Guidelines for the Erection of Precast Concrete Products" MNL 127.

D. Fabricator Qualifications: A firm that complies with the following requirements and is experienced in producing structural precast concrete units similar to those indicated for this Project and with a record of successful in-service performance.

1. Participates in PCI's Plant Certification program at the time of bidding and is designated a PCI-certified plant for Group C, Category C2 - Prestressed Hollow-Core and Repetitive Products.
2. Has sufficient production capacity to produce required units without delaying the Work.

1.04 SUBMITTALSA. General: Submit Shop Drawings, Product Data, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.B. Shop Drawings: Prepare and submit Shop Drawings of all Work for review PRIOR to production. Production shall not be started until Contractor has received approved Shop Drawings from Architect. Shop Drawings shall include, but not necessarily be limited to providing the following information.

1. Layout and setting plans.
2. Reinforcement details, including grade designations of reinforcing steel.
3. Each precast unit shall be identified by a standard mark and listed in the schedule shown on the manufacturer's erection plans. Identification marks shall also be placed legibly on each unit at time of manufacture.
4. Dimensions, including lengths and slab unit thickness.
5. Connection details, including special reinforcement and lifting devices necessary for handling and erection.
6. Insert details.
7. Joint treatment.
8. Aggregate type.
9. Strength of concrete.
10. Submit with Shop Drawings, complete calculations indicating design loads. All Shop Drawings and calculations shall be sealed by a Professional Structural Engineer licensed in the State of the proposed Project and experienced in the design of precast concrete units.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Product delivery, storage and handling shall be in accordance with the manufacturer's recommended procedures and as specified herein.
- B. Deliver precast units to Project site in such quantities and at such times to assure continuity of installation. Store units to prevent cracking, warping, staining or other damage. Lift and support precast units only at designated lifting or supporting points.

1.06 COORDINATION WITH OTHER CONTRACTORS

- A. Cooperate with all other Contractors to insure coordinated erection schedule, location of openings, and supports.

PART 2 - PRODUCTS

2.01 PRECAST CONCRETE SLABS

- A. Type of Slabs: Floor slabs shall be shop fabricated, hollow core with voids running lengthwise, precast, prestressed, reinforced concrete units, of depths noted on Drawings, of single lengths between supports, of minimum 24" widths. Each plank shall bear the stamp of the Independent Testing Laboratory attesting to conformance to the Specifications.

2.02 DESIGN

- A. Precast concrete units and all associated components shall be designed by a Professional Structural Engineer registered in the State of the proposed Project. All drawings shall be prepared under the supervision of the Professional Structural Engineer. Drawings and calculations for the design of the precast concrete units shall all be sealed by the same Professional Structural Engineer.
- B. Slabs shall be designed in accordance with ACI 318 - Building Code Requirements for Structural Concrete.
- C. Live loads and superimposed dead loads shall be as designated on the Drawings, and in accordance with the latest Local Building Code and Project requirements.

2.03 MATERIALS

- A. Concrete Materials: All concrete materials shall be clean and properly graded and the resulting concrete shall have a minimum compressive strength of 3500 psi at time of initial prestress and 5000 psi at 28 days.
 - 1. Portland Cement: ASTM C150 - Standard Specification for Portland Cement.
 - 2. Aggregates:
 - a. Natural Weight: ASTM C33 - Standard Specification for Concrete Aggregates.
 - b. Lightweight: ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.
 - 3. Admixtures: Do not use admixtures containing calcium chloride, chloride ions or other salts.

B. Reinforcement:

1. Prestressing Steel: Uncoated seven-wire, stress-relieved strand in accordance with ASTM A416 - Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete, Grade 250k or 270k.
 2. Bars: Deformed-billet steel, ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement, Grade 40 or 60.
- C. Structural Steel Plates and Shapes: Fabricated from new open hearth steel conforming to ASTM A36 - Standard Specification for Carbon Structural Steel.
- D. Welded Studs: In accordance with AWS D1.1.
- E. Bearing Strips: Tempered hardboard, Korlath or equal, or neoprene.
- F. Grout: One part Portland cement to three parts sand and water sufficient for placement and hydration.
- G. Caulking: Non-shrinking, non-staining thermo-plastic putty - Architectural Gun Grade, Federal Specification TT-C-598, Type 1.

2.04 FABRICATION

- A. Cast-in Anchors, Inserts, Angles and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement. Do not relocate bearing plates in units unless approve by Architect.
1. Weld headed studs and deformed bar anchors used for anchorage according to AWS D1.1 and AWS C5.4, "Recommended Practices for Stud Welding."
- B. Furnish loose steel plates, clip angles, anchors, dowels, hangers, and other hardware shapes for securing precast concrete units to supporting and adjacent construction.
- C. Cast-in-slots, holes, and other accessories in structural precast concrete units as indicated on Contract Drawings.
- D. Reinforcement: Comply with recommendations in PCI MNL 116 for fabrication, placing, and supporting reinforcement.
1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete.
 2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations.
 3. Place reinforcing steel and prestressing steel to maintain a minimum 3/4 inch concrete cover. Increase cover requirements in accordance with ACI 318 when units are exposed to corrosive environment or severe exposure conditions.
- E. Reinforce structural precast concrete units to resist handling, transportation, and erection stresses.
1. Delay detensioning of precast prestressed concrete units until concrete has reached its indicated minimum design release compressive strength as established by test cylinders cured under the same conditions as concrete member.

2. Detension pretensioned tendrons either by gradually releasing tensioning jacks or by heat-cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
- F. Mix concrete according to PCI MNL 116 and requirements in this Section. After concrete batching, no additional water may be added.

2.05 FABRICATION TOLERANCES

- A. Fabricate structural precast concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished unit complies with PCI MNL 116 or PCI MNL 135 product tolerances as well as position tolerances for cast-in items.

2.06 SOURCE QUALITY CONTROL

- A. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 116 requirements.
- B. In addition to PCI Certification, owner will employ an independent testing agency to evaluate structural precast concrete fabricator's quality-control and testing methods.
 1. Allow Owner's testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with Owner's testing agency and provide samples of materials and concrete mixes as may be requested for additional testing and evaluation.
- C. Precast concrete units will be considered deficient if units fail to comply with ACI 318 strength requirements.
- D. Defective Work: Structural precast concrete units that do not comply with acceptability requirements in PCI MNL 116, including concrete strength and manufacturing tolerances, are unacceptable. Chipped, spalled or cracked units may be repaired. Replace unacceptable units with precast concrete units that comply with requirements.

PART 3 - EXECUTION

3.01 ERECTION AND INSTALLATION

- A. Handle, lift and set precast concrete slabs to avoid damage. Slabs that are cracked, broken, have chipped corners, or are otherwise damaged will be rejected. Remove rejected slabs from site immediately. Erect and anchor slabs in accordance with the manufacturer's written specifications, and as specified herein.
- B. Set bearing strips where required.
- C. Install precast units by setting the roof slabs level and square in a workmanlike manner keeping the units tight and at right angles to the bearing walls and/or steel beams. Slabs shall be aligned and leveled by the method approved by the precast concrete slab manufacturer, using equipment recommended or supplied by the manufacturer.
- D. Slabs shall be grouted by a mixture of not less than one part cement to three parts fine sand, care being taken to see that the joints are filled. Any grout that may have seeped through to the ceiling area below shall be removed before it hardens.
- E. Cooperation shall be extended to other trades in permitting insertion of anchors, hangers, and electrical outlets.

3.02 GROUTING

- A. General: After all slabs have been set and secured, and anchorage grout has hardened, mechanically level all slabs flush with each other, and fill joints between slabs with grout as specified herein. Do not remove mechanical leveling devices until grout has hardened. Finish grout flush with slab surfaces, top and bottom. Finish grout on underside of slabs that will be exposed in the finish Work to match texture of slabs. Coordinate grouting Work with contractors who are hanging construction from the slabs, to permit installation of hangers prior to grouting.
1. Between Slab Edges: Fill grout key. Remove any grout that may seep through to area below before it hardens. During and after erection, remove all grout drippage from adjacent surfaces.
 2. Slab Ends: Provide suitable end cap or dam in voids as required.

3.03 OPENINGS

- A. Holes not requiring cutting of prestress strand, for items such as plumbing and heating pipes, ducts, electric conduits, outlet boxes, and vents shall be cut in the field by the trade contractor requiring the opening in accordance with the manufacturer's recommendations. Holes requiring cutting of prestress strand shall be planned in advance of installation as dictated by structural considerations. No prestress strand shall be cut without approval of the precast concrete slab manufacturer and the Architect. All openings larger than a slab width shall be framed with concrete headers or structural steel hangers in accordance with the design limitations of ACI 711-58.
- B. Openings through slabs of 8" diameter and smaller shall be drilled by the contractor requiring the opening. Precast Concrete Contractor shall instruct other contractors where holes may be cored, and allowable methods for cutting holes. Do not permit reduction of carrying capacity of slabs by cutting of holes.
- C. Provide all openings and holes through slabs larger than 8" in size. Openings and holes up to 16" in diameter or size may be formed into the slabs during casting. Provide steel headers to support ends of slabs having openings larger than 16" in diameter and size, and to support ends of slabs at columns and at other locations where supporting steel building framing of load carrying walls are not provided.

3.04 OPENING CLOSURES

- A. Solidly fill in all openings around penetrations with 3000 psi grout. Finish grout flush with slab surfaces, top and bottom. Finish grout on underside of slabs that will be exposed in the finish Work to match texture of slabs.

3.05 MISCELLANEOUS CLOSURES

- A. Where layout creates minor areas of shape and size which cannot be practically formed with plank units, form areas with cast-in-place, reinforced concrete. Submit reinforcement for approval on Shop Drawings.

3.06 ERECTION TOLERANCES

- A. Erect structural precast concrete units level, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 135. Level out variations between adjacent members by jacking, loading, or any other feasible method as recommended by the manufacturer and acceptable to the Architect.

3.07 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections.
- B. Field welds will be subject to visual inspections and non-destructive testing in accordance with ASTM E 165 or ASTM E 709.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Repair or remove and replace work that does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.08 CAULKING

- A. Where precast concrete slab units are to be used as a finished ceiling and painted, ceiling joints shall be caulked by Precast Concrete Contractor prior to painting, by the method approved by the precast concrete slab manufacturer. Apply caulking uniformly, using no more than required to fill the joints.

3.09 CLEANING

- A. After completion of erection, clean all exposed surfaces in the finish Work, removing all dirt, grime and defacements resulting from handling and erection.
- B. During and after erection, remove all surplus materials, rubbish and debris resulting from Precast Concrete Work.

END OF SECTION

SECTION 04 20 00MASONRY

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, equipment, apparatus, tools, transportation, protection, and services necessary for Masonry Work as indicated on Drawings and specified herein. Work includes, but is not limited to the following:
1. Water Repellent (Integral System for Concrete Masonry Units and Mortar).
 2. Concrete Masonry Units, including Integrally Colored Masonry Units.
 3. Masonry Lintels where required by the Drawings.
 4. Mason's Iron.
 5. Wall Flashings: CMU Drainage System, and Fabric Flashing.
 6. Cavity (Mortar) Mesh and Weep Vents.
 7. Set and Build-In Hollow Metal Door Frame Assemblies in Masonry Walls.
 8. Set and Build-In Items furnished by others.
 9. Installation of Downspout Guards.
 10. Installation of Fire Department Key Box(es), where required.
 11. Grout Stop.
 12. Cleaning and Pointing.
- B. Color Selections: Refer to the Drawings.
- C. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:
1. Concrete Foundation Work - Section 03 00 50.
 2. Cast-In-Place Concrete Work - Section 03 30 00.
 3. Structural Precast Concrete - Section 03 41 13.
 4. Furnishing Steel Lintels and Bolts and Downspout Guards - Section 05 50 00.
 5. Rough Carpentry - Section 06 10 00.

6. Foamed-In-Place Insulation - Section 07 21 19.
7. Membrane Sheet Roofing System - Section 07 53 23.
8. Metal Copings and Flashings - Section 07 60 00.
9. Joint Protection - Section 07 90 00.
10. Furnishing Pressed Steel Frames - Section 08 11 13.
11. Overhead Coiling Doors - Section 08 33 23.
12. Furnishing Fire Department Key Box(es) - Section 08 70 00.
13. Gypsum Wallboard Construction - Section 09 29 00.
14. Painting, Staining, Coating, and Sealing Work - Sections 09 91 13 and 09 91 23.
15. Loading Dock Equipment - Section 11 13 00.
16. Exterior Light Fixtures - Division 26.

1.02 QUALITY ASSURANCE

- A. Standard Specifications and Codes: Except as otherwise specified herein, materials and workmanship shall conform to the following current standard specifications and to codes having jurisdiction.
 1. ASTM International Standard Specifications as applicable and as specified herein by number.
 2. American Concrete Institute (ACI), American Society of Civil Engineers (ASCE), and The Masonry Society (TMS).
 - a. Building Code Requirements for Masonry Structures, ACI 530, ASCE 5 and TMS 402.
 - b. Specifications for Masonry Structures, ACI 530.1, ASCE 6 and TMS 602.
- B. Field Constructed Mock-Up:
 1. General: Prior to installation of unit masonry; erect 4'-0" long by 4'-0" high by full thickness sample wall panel, to demonstrate aesthetic effects as well as qualities of material and workmanship. Locate construction as a standard for judging completed masonry construction. When directed by Architect, demolish and remove mock-up from the site.
 2. CMU Drainage System Mock-Up: Build drainage pans into sample panel of masonry wall as specified herein. Obtain Architect's approval prior to proceeding with any masonry Work.
- C. Field Inspection and Testing: Contractor shall employ Testing Laboratory to perform on-site testing and inspection of Work in progress. Provide tests to determine unit strength of masonry assembly in compliance with ACI 530.1. Provide inspection of Work in progress per ACI 530.1 with reports sent to Architect for every 1500 sq. ft. of masonry installed. Reports shall include mortar and grout strength, rebar location and lap length, grouting methods and verification of proper composite wall grout placement, statement of whether masonry meets Project Plans and Specifications.

- D. Fire Performance Characteristic: Where indicated, Contractor shall provide materials and construction identical to those of assemblies whose fire resistance has been determined by the U.L. Design and ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials, by a testing and inspecting organization acceptable to authorities having jurisdiction.
 - 1. Provide Standard Method for Determining Fire Resistance of Concrete and Masonry Construction Assemblies (ANSI/ACI 216.1, TMS-0216).
- E. Inspecting Laboratory Qualifications: To qualify for employment in performing tests and inspection specified in this section, an Independent Testing Laboratory must demonstrate to Architect's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry, that it has the experience and capability to conduct satisfactorily the testing required without delaying the progress of the Work.

1.03 SUBMITTALS

- A. General: Submit Shop Drawings, Product Data, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Shop Drawings: Prepare detailed Shop Drawings for steel/metal reinforcing, including detailing fabricating, bending, and placing unit masonry bars. Comply with American Concrete Institute "SP-66 ACI Detailing Manual" (formerly ACI 315) showing bar schedules, stirrup spacing, diagrams of bent bars and arrangement of masonry reinforcement.
- C. Product Data: Submit product literature for review, including products specified herein under article heading "MISCELLANEOUS ITEMS".
- D. Mix Design: Furnish description of mortar and grout components, proportions, and twenty-eight (28) day compressive strengths.
- E. Certificates: Submit written certification to the Architect and to the Owner, stating each type of masonry unit conforms to the Specifications, and the concrete block units have been seasoned as specified. Submit certificates of Fire Rating for Fire Rating Concrete Block.
- F. Samples: Before commencing Work, submit two (2) typical units for each type of integrally colored masonry units, for establishing an approved color and texture to the Architect for review and written approval.

1.04 PRODUCT DELIVERY, HANDLING AND STORAGE

- A. General: Ship all masonry units to the site on pallets and store above the ground. Cover all units with waterproof coverings, to keep dry and prevent water absorption from rain and condensation. Handle all units to prevent damage. Avoid excess movement before installation. Do not place units directly on ground. Do not dump units in piles. Do not double stack pallets.

1.05 SCAFFOLDING AND WEATHER PROTECTION

- A. Furnish, erect, and maintain all scaffolding as required by field conditions, tarpaulins, and enclosures, complying with code requirements, as required for Work. Erect apparatus and provide protection at times and locations so as not to delay any part of Work. When apparatus and protection is no longer required, promptly dismantle and remove from the site.
- B. Contractor shall assume full responsibility for protection of the Work against damage from frost or freezing.

1. Provide and maintain suitable housings, coverings, temporary heat, and other protection or facilities as required to conform with the above requirements.
 2. When heating materials, use accepted methods that do not damage, contaminate or have deleterious effects on the materials.
- C. All masonry units shall be laid dry. Do not lay units that are wet or frozen.
- D. Tops of all masonry exposed to the weather shall be securely covered at completion of each day's Work.

1.06 PRECAUTIONS DURING ERECTION

- A. Bracing Masonry Construction: Take all precautions to brace masonry walls during erection to resist wind or other lateral loads until such time permanent bracing (roof steel) at roof-level is erected.
- B. Adequate Bracing: Provide OSHA acceptable and adequate bracing for masonry construction in accordance with the latest edition of "Standard Practice for Bracing Masonry Walls Under Construction Developed by the Council for Masonry Wall Bracing."
- C. Masonry Wall Failures: If masonry walls fail prior to the erection of the permanent roof bracing (roof steel), Masonry Contractor shall repair or replace masonry walls at his expense, to the satisfaction of the Architect.

1.07 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense, any imperfections which may develop during the warranty period, as well as damage to other Work caused by imperfections or repairing of imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance of the installation.

PART 2 - PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. General: Concrete masonry units shall be of nominal face sizes as shown on the Drawings, as approved by Architect and local building department.
1. All units shall be load-bearing, conforming with the following requirements:
 - a. Standard (uncolored) Hollow, Load-Bearing Medium Texture Units, ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.
 - b. Integrally Colored, Hollow, Load-Bearing, Split-Face Units, ASTM Standard C90.
 - c. Integrally Colored, Hollow, Load-Bearing, Smooth-Face Units, ASTM Standard C90.
 2. Weight Type: One weight type of block is required; normal weight for all block walls below first floor elevation; normal weight two or three core block for all other Work. Normal weight block shall be made with stone or gravel aggregate conforming with ASTM Standard C33; and weighing not less than 125 p.c.f., oven dry. Cinder aggregate will not be permitted.
 3. Minimum Compressive Strength: All concrete masonry units shall have a "Net Area Compressive Strength" of 1900 psi, minimum.

4. Drying Shrinkage: Concrete block shall comply with changes in linear dimension from a saturated condition to an equilibrium weight and length under accelerated drying conditions as specified within ASTM C426 - Standard Test Method for Linear Drying Shrinkage of Concrete Masonry Units.
 5. Face Size and Thicknesses: Unless otherwise specified and/or indicated on the Drawings, provide block units having a nominal 8" x 16" face size in general; other block units of thickness required for walls, shall have the following minimum shell thicknesses:
 - 4" wide unit: 3/4"
 - 6" wide unit: 1"
 - 8" wide unit: 1-1/4"
 - 10" wide unit: 1-1/4"
 - 12" wide unit: 1-1/4"
 6. Quality of Masonry Units: All masonry units shall be sound, and free from cracks and structural defects. All exposed units in the finish Work shall be uniform in texture, free from broken corners or edges, chips, pops, stains, and other blemishes.
 7. Exposed Corner: All exposed corners of interior concrete masonry units and interior face side of exterior masonry units shall be bullnosed.
- B. Custom Shapes: Provide special custom concrete masonry unit shapes, to be used in their respective locations as required by the Drawings and/or field conditions.
 - C. Fire Rated Concrete Block: Comply with Underwriters' Laboratories Design(s) as noted on the Drawings, and as specified herein under Article QUALITY ASSURANCE.
 - D. Masonry Lintel Units: Lintels shall match size, face size of adjacent masonry units in wall.
 - E. Concrete Brick: Provide concrete brick as required Drawings and/or field conditions. Comply with requirements of ASTM C55 - Standard Specification for Concrete Building Brick; Classification Type I, Grade S.
 - F. Integrally Colored Masonry Units: Manufactured with natural aggregates conforming with ASTM Standard C55. Coloring pigments shall be pure, chemically inert non-fading alkali-fast mineral oxides, finely ground and specifically prepared for use in the formation of concrete units.
1. Manufacturers: Masonry units shall be as manufactured by one of the following, or comparable manufacturer's equivalent products subject to review by the Architect.
 - a. Best Block Company, 22001 Groesbeck, Warren, MI 48089, (586)772-7000; www.bestblock.net.
 - b. Fendt Builder's Supply, Inc., 22005 Gill Road, P.O. Box 418, Farmington Hills, MI 48332, (248)474-3211; www.fendtproducts.com.
 - c. Grand Blanc Cement Products, 10709 South Center Road, Grand Blanc, MI 48439, (800)875-7500 or (810)694-7500; www.grandblancement.com.
 - d. National Block Company, 39000 Ford Road, Westland, MI 48185, (734)721-4056; www.nationalblock.com.
 2. Masonry Unit Types: Provide the following units as indicated on the Drawings.

- a. Split Face Masonry Units: Nominal sizes shall include the following, split face on one side.
 - 1. 8"D x 8"H x 16"L.
 - 2. 12"D x 8"H x 16"L.
 - b. Smooth Face Masonry Units: Nominal sizes shall include the following.
 - 1) 8"D x 8"H x 16"L.
 - 2) 12"D x 8"H x 16"L.
 - 3. Color and Shade: As noted on the Drawings. Substitutions of color and shade will not be permitted.
- G. Integral Water Repellent Admixture: Provide DRY-BLOCK® Block Admixture, Integral Water-Repellent Admixture for Concrete Masonry Units as manufactured by Grace Construction Products, W.R. Grace & Co. - Conn., 62 Whittemore Avenue, Cambridge, MA 02140, (800)558-7066 or (877)423-6491; www.DryBlock.com. Admixture shall be added and mixed throughout the concrete during manufacture of masonry units in accordance with the manufacturer's requirements.

2.02 MORTAR MATERIALS

- A. Cement: An approved brand of Type I Portland Cement conforming to ASTM C150 -Standard Specification for Portland Cement.
- B. Lime: An approved brand of hydrated lime conforming with ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
- C. Sand: Rescreened, clean, sharp, washed materials, free from deleterious substances, conforming with ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
- D. Colored Mortar: Color shall be the product of pure natural and/or synthetic iron oxides which are finely milled (95-99% minus 325 mesh) and blended under strict quality control procedures producing uniform and consistently strong tinting strength colors. Color shall meet or exceed the requirements set forth by ASTM C979 - Standard Specification for Pigments for Integrally Colored Concrete. Color shall be inert, stable to atmospheric conditions, sunfast, weather resistant, alkali resistant, water insoluble, and free of fillers, admixtures and extenders.
 - 1. Manufacturers: Provide colored mortar by one of the following, or comparable manufacturer's equivalent product subject to review by the Architect.
 - a. Glen-Gery Corporation, 1166 Spring Street, P.O. Box 7001, Wyomissing, PA 19610-6001, (610)374-4011; www.glengerybrick.com.
 - b. Solomon Colors, Inc., 4050 Color Plant Road, Springfield, IL 62702, (217)522-3112 or (800)624-0261; www.solomoncolors.com.
 - 2. Colors: As required to match color of integrally colored masonry units, unless otherwise noted on the Drawings.
- E. Non-Colored Mortar: Provide natural standard non-colored mortar for areas designated to be painted, unexposed to view or subsequently covered by other materials.

- F. Mortar Mix: Mortar shall conform to ASTM C270 - Standard Specification for Mortar for Unit Masonry.
- G. Mixing Water: Potable water (suitable for drinking) shall be clean, free from oils, alkalies, acids, organic water, or other deleterious materials.
- H. Admixtures: Air content shall be limited to 12%.
 - 1. Water-Repellent Mortar Admixture: Provide DRY-BLOCK® Mortar Admixture, integral water-repellent mortar admixture as manufactured by Grace Construction Products, W.R. Grace & Co.-Conn., 62 Whittemore Avenue, Cambridge, MA 02140, (800)558-7066 or (877)423-6491; www.DryBlock.com.
 - 2. Prohibited Admixtures and Compounds:
 - a. Air-entrained admixtures or material containing air-entrained admixtures are prohibited.
 - b. No anti-freeze compounds or other substances containing chlorides shall be added to mortar.

2.03 PROPORTIONS AND USE OF MORTAR

- A. Mortar Type: For all masonry, except as otherwise listed below, provide Type S mortar conforming to ASTM Standard C270. Minimum strength of mortar shall be 1800 psi at 28 days. Type N mortar is acceptable for veneers and reinforced concrete masonry units.
- B. Cement Lime Mortar For Below Grade Masonry Work: Cement lime mortar shall be proportioned one part cement; 1/4 part lime; 3 parts damp, loose sand, by volume.
- C. Cement Lime Mortar For All Other Masonry Work: Cement lime mortar shall be proportioned one part cement; one part lime; 6 parts damp, loose sand, by volume.
- D. Masonry Cement: Masonry cement per ASTM C91 - Standard Specification for Masonry Cement, with a preferred air entrainment of not less than 10% will be acceptable.
- E. Pre-Blended Mortar Mixes: In lieu of field mixed cement lime mortar specified above, the Contractor may use a prepared mortar, providing he has secured the Architect's approval before installation. Prepared mortar products and system shall be of manufacturer as specified herein.
 - 1. Manufacturer: SPEC MIX®, Inc., 1230 Eagan Industrial Road, Suite 160, Eagan, MN 55121, (888)773-2649 or (651)994-7120; www.specmix.com, in accordance with ASTM C1714 - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry.
 - 2. System and Products: SPEC MIX®/QUIKRETE® Preblended Mortar Mix, factory manufactured instead of field prepared mortars. Pre-blended mortar shall include manufacturer's standard silo system for mixing and delivery of mortar mixes, as provided and delivered by the local SPEC MIX® Licensed Manufacturer.
 - a. Mortar and Grout Mixes: Pre-blended factory mortar and grout mixes shall be mixed with potable water in strict compliance with manufacturer's standard silo system for mixing and delivery system of mortar, or 80 lb. bags of pre-blended as governed.
- F. Mortar Masonry Mix Designs: Provide admix products in accordance with the specified manufacturers' proportioned formulas for mortar type, and color specified herein and/or noted on the Drawings, subject to review by the Architect. Admix products shall be proportioned as recommended by the specified manufacturers to assure compatibility and proper blend in the mix.

2.04 GROUTING

- A. Fine Grout: Comply with ASTM C476 - Standard Specification for Grout for Masonry, for filling spaces less than 4" in one or both horizontal directions.
- B. Coarse Grout: Comply with ASTM Standard C476 for filling 4" spaces or larger in both horizontal directions.
- C. Block Masonry Fill: Grout fill for block cores shall meet or exceed the specified compressive strength of the masonry f'm, but shall be at least 2000 p.s.i. compressive strength at 28 days.

2.05 STEEL/METAL REINFORCING

- A. Steel Bar Reinforcing: Reinforcing shall be not less than sizes indicated on the Drawings and shall conform with the requirements of ASTM Standard A615, Grade 60, or ASTM Standard A996, Grade 60 or ASTM Standard A706, Grade 60.
- B. Rebar Positioners: Prefabricated, 9 gauge cold-drawn steel z-shaped wire per ASTM Standard A82, hot-dipped galvanized after fabrication per ASTM Standard A153 Class B, not less than 1.50 oz. per sq. ft. Provide rebar positioners to ensure accurate placement of vertical reinforcing. Rebar positioners shall be such as fabricated by one of the wire reinforcing manufacturers as specified herein.
- C. Horizontal Joint Reinforcing: Prefabricated, standard weight, 9 gauge cold drawn steel wire per ASTM Standard A82, hot-dipped galvanized after fabrication per ASTM Standard A153 Class B, not less than 1.50 oz. per sq. ft. Provide wire reinforcing in widths approximately 1-1/2" less than wall thickness. Provide wire reinforcing by the following manufacturer:
 - 1. Manufacturer: Hohmann & Barnard, Inc., 30 Rasons Court, Hauppauge, NY, 11788-0270, (631)234-0600 or (800)645-0616; www.h-b.com.
 - a. Single Wythe Block Wall Construction: LoxAll® Reinforcement, Ladder Type, #220 Ladder-Mesh.
 - b. Adjacent Wythe Construction: LoxAll® Adjustable Reinforcement, Ladder Type, #270 Ladder LoxAll® Adjustable Eye-Wire.
- D. Mechanical Bar Splicing:
 - 1. Manufacturer: Dayton Superior Corporation, 1125 Byers Road, Miamisburg, OH 45342, (800)745-3700, (888)977-9600 or (937) 866-0701; www.daytonsuperior.com.
 - 2. Product: Mechanical Bar Splicing System, subject to review by the Architect/Structural Engineer.

2.06 MASONRY ANCHORS AND WALL TIES

- A. Manufacturer: Products specified herein shall be as manufactured by Hohmann & Barnard, Inc., 30 Rasons Court, Hauppauge, NY 11788-0270, (631)234-0600 or (800)645-0616; www.h-b.com, or comparable equivalent products of other manufacturers subject to review by the Architect.
 - 1. Anchor Straps and Ties:
 - a. General: Unless noted otherwise on Drawings, masonry anchors at steel beams and columns shall be two-piece steel anchor straps and ties. Where there is no length restriction, strap anchors shall be 6" minimum.

- b. Column Ties: #359 Series - Weld-On Ties at the web and #359-C - Weld-On Ties at the column flanges, furnished and installed by Structural Steel Contractor.
 - c. Anchor Ties: #302W - Column Web Tie at the web and #VB - Vee-Byna Ties® at the column flange, furnished and installed by Masonry Contractor.
2. Slotted Channel and Bent Steel Anchors:
- a. Slotted Channel Anchors: #360-Gripstay Channels welded to steel columns and steel beams at 24" O.C. spacings (unless otherwise noted), furnished and installed by the Structural Steel Contractor.
 - b. Bent Steel Anchors: #365-Bent Gripstay Anchors furnished and installed by the Masonry Contractor.
3. Concrete Masonry Unit Veneer Anchors and Ties:
- a. Without Cavity Insulation: Hot-Dip galvanized steel, 12 gauge thick, "DW-10® Veneer Anchor" with Vee Byna-Tie not less than 3/16" diameter for masonry veneer on masonry or metal stud wall construction.
 - b. Cavity Insulation on Masonry: Stainless Steel-Type 304 "Thermal Concrete 2-Seal™ Wing Nut Anchor" with Hot-Dip galvanized hook not less than 3/16" diameter for masonry veneer with cavity insulation on masonry wall construction.
 - c. Thickness: Refer to Drawings for cavity insulation and air space thickness.
- B. Finish: Products specified herein shall be Hot-Dip Galvanized after fabrication conforming with the requirements of ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; Class B (not less than 1.5 oz. zinc coating per sq. ft.), unless otherwise specified.

2.07 MISCELLANEOUS ITEMS

A. Wall Flashings:

- 1. CMU Drainage System: Provide for single wythe concrete masonry construction as indicated on the Drawings, BlockFlash® as manufactured by Mortar Net Solutions®, 326 Melton Road, Burns Harbor, IN 46304, (800) 664-6638; www.mortarnet.com.
 - a. CMU cell flashing pans with built-in adjoining bridge shall be of high-density recycled polyethylene composition .0625 inch thick with perimeter flange, with a weep spout opening and a 45 degrees drip edge that extends 1.0 inch from the outer flange. Provide drainage pans as required for wall system depth as indicated on the Drawings.
- 2. Fabric Flashing: Composite flexible flashing shall be 40 mil total thickness self-adhesive, cold-applied sheet wall membrane consisting of 32 mil of rubberized asphalt integrally bonded to an 8 mil high density, cross-laminated polyethylene film. Fabric flashing shall be such as Grace Waterproofing Products "Perm-A-Barrier®" Wall Flashing as manufactured by Grace Construction Products, 62 Whittemore Avenue, Cambridge, MA 02140, (866)333-3726 or (617)876-1400; www.graceconstruction.com. Provide fabric flashing as specified herein, or comparable equivalent product subject to review by the Architect.

- B. Column Wrap/Isolation Material: Asphalt impregnated cellular paper double faced sheet product, minimum of 1/4" thick, "Column Boxboard" material, as manufactured by Williams Products, Inc., 1750 Maplelawn Blvd., Troy, MI 48084, (800)521-9594 or (248)643-6400; www.williamsproducts.net, or comparable equivalent product subject to review by the Architect.
- C. Isolation Material: Bond Breaker Waterproof Building Paper conforming to ASTM Standard C171.
- D. Joint Filler: Polyethylene, closed-cell compressible foam expansion-joint filler such as Sonneborn® "Sonolastic® Expansion-Joint Filler", as manufactured by BASF Construction Chemicals, LLC - Building Systems, 889 Valley Park Drive, Shakopee, MN 55379, (800)433-9517 or (800)243-6739; www.BuildingSystems.BASF.com, or comparable equivalent product subject to review by the Architect.
- E. Cavity Mesh and Weep Vents:
 - 1. Manufacturer: Mortar Net Solutions® 326 Melton Road, Burns Harbor, IN 46304, (800)664-6638 or (219)787-5080; www.mortarnet.com.
 - 2. Comparable Manufacturers:
 - a. Hohmann & Barnard, Inc., 30 Rasons Court, Hauppauge, NY 11788-0270, (631)234-0600 or (800)645-0616; www.h-b.com.
 - b. Sandell Manufacturing, 310 Wayto Road, Schenectady, NY 12303, (518)357-9757 or (800)283-3888; www.sandellmfg.com.
 - 3. Cavity Mesh: "MortarNet®" manufactured of High Density Polyethylene (HDPE), or recycled polyester. Product is 90% open-weave green mesh in a dovetail configuration.
 - 4. Weep Vents: "Mortar Net® Weep Vents™" manufactured of recycled polyester with a 90% open-weave polyester mesh bonded with a flame retardant adhesive. Provide weep vents with color to match mortar.
- F. Pea Gravel: Provide clean, washed pea gravel where required and/or indicated on the Drawings.
- G. Grout Stop: Provide masonry miscellaneous accessory product as specified herein for areas as designated on the Drawings to prevent grout from falling into lower cells of CMU wall.
 - 1. Manufacturer: Hohmann & Barnard, Inc., 30 Rasons Court, Hauppauge, NY, 11788-0270, (631)234-0600, or (800)645-0616; www.h-b.com.
 - 2. Masonry Product: MGS-Mortar/Grout Screen, 1/4" square monofilament screen fabricated from micro-thin, high-strength, non-corrosive polypropylene polymers.
 - a. Width of grout stop product shall be 2 inches less than the block to which it is to be installed, where indicated on the Drawings, and as recommended by the manufacturer.

2.08 MASONRY CONTROL JOINTS

- A. Control Joints: Provide "Michigan Type" control joints where and as indicated on the Drawings, or comparable equivalent products subject to review by the Architect, consisting of the following:
 - 1. Masonry unit and/or steel column.
 - 2. Isolation Material: Miscellaneous item as specified herein.

3. Compressible Filler: Non-absorbent, closed cell, expanded rubber strip seal gasket, neoprene grade, conforming to ASTM D1056 - Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
 - a. Manufacturer: Williams Products, Inc., 1750 Maplelawn Blvd., Troy, MI 48084, (800)521-9594 or (248)643-6400; www.williamsproducts.net.
 - b. Product: Everlastic® Weathertite “R” 0318-3, 1/2" gasket.
 4. Sealant: As specified in Section 07 90 00 - Joint Protection, with color to match adjacent mortar grout.
- B. T-type Control Joints: Control joint material with compressible hollow wings shall be manufactured of high grade synthetic rubber compounds. Polymer shall be blended EPDM/SBR/CR, ASTM Standard D2000; 3BA810-80 Shore A Hardness, 1000 PSI tensile. Material shall exceed standards of 2AA805 (80 hardness - 500 PSI tensile).
1. Manufacturer and Product: Williams Products, Inc., 1750 Maplelawn Blvd., Troy, MI 48084, (800)521-9594 or (248)643-6400; www.williamsproducts.net, “Everlastic® Block Seal 2018-3”.
 2. Comparable Products: Control joint product by manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect’s review.

PART 3 - EXECUTION

3.01 MORTAR MIXING

- A. Measuring and Mixing: All mortar materials shall be accurately measured and mixed in a mechanical batch mixer, in the proportions specified and to a uniform consistency.
- B. Material Measurement: All materials shall be measured by volume, and, for this purpose 40 lbs. of hydrated lime shall equal 1 cu. ft.
- C. Integral Water Repellent Admixture: Admixture shall be added to the mortar during the mixing process at the recommended dosage rate in accordance with the manufacturer’s requirements.
- D. Mortar Quantities: Mortar shall not be mixed in greater quantities than required for immediate use, as no retempering of mortar will be allowed.
- E. Colored Mortar: Colored mortar shall be mixed in clean mixers or containers. Mix colored mortar separately from non-colored mortar.
- F. Prohibited Materials: The use of salt, chlorides, anti-freezing or set accelerating mixture in mortar is prohibited.

3.02 LAYING MASONRY UNITS

- A. General: Contractor shall meet tolerance standards of ACI 530.1, except as follows herein.
 1. Layout all Work carefully in advance, to make all joints, both horizontal and vertical, fit the openings and reveals indicated on the Drawings. All joints shall be of uniform equal widths.
 2. All corners shall be true 90° angles unless otherwise distinctly shown or noted on the Drawings.

3. Surface of all walls and partitions that will have the masonry exposed in the finished Work, whether painted or not, and the surface of all walls and partitions that will be covered with material that does not lend itself to the straightening of surfaces shall be constructed in absolutely straight, true and plumb planes.
 4. Surface of walls and partitions that will not be exposed in the finished Work may vary up to 1/8" maximum in 8'-0", vertically from a true, plumb plane, horizontally from a straight line.
 5. Fill-in the space between door frames and masonry tight with mortar.
 6. Unfinished Masonry Work shall be raked back where possible and toothed only where absolutely necessary.
 7. Provide all reglets and chases for flashing material and any other Work as shown or required. Joints shown or specified to be caulked or sealed shall be raked back 1/2" to allow for same. Joints that will receive metal flashing shall be raked back 1-1/2" deep to receive same.
- B. Cold-Weather Masonry Construction Procedures: All cold weather masonry construction shall conform with requirements and recommendations of referenced Standard ACI 530.1, Article 1.8C.
- C. Hot-Weather Masonry Construction Procedures: All hot weather masonry construction shall conform with requirements and recommendations, as required, of referenced Standard ACI 530.1, Article 1.8D.
- D. Concrete Block Work:
1. Water repellent mortar admixture product as specified herein shall be provided for use in constructing exterior exposed concrete masonry block walls as indicated on the Drawings.
 2. All block units shall be laid with cells vertical in walls and in such a manner that the main bearing webs come in proper relation with the bearing of units below, when three cell blocks are used.
 3. Joints shall be worked so as to bond properly with any facing of backing materials.
 4. All contact of units at shell beds shall have a full bed of mortar, and, in the case of walls below the first floor, place full beds of mortar shall be placed on block webs also. Fill all side contacts at joints with mortar.
 5. All block units below First Floor Line or Grade Line (whichever is higher) shall be standard weight, solid, load bearing units. At exterior walls, if three core units are used at such areas, grout all cells solid with concrete fill.
 6. All units shall be laid up in running bond with alternate vertical joints aligned. All horizontal joints shall be kept level. All joints shall be uniform in width and thickness in accordance with ACI 530.1 tolerances. All joints where exposed in the finish Work shall be tooled slightly concave; all other joints shall be cut off flush.
 7. Except at control joints, intersecting masonry walls shall be tied together with metal ties in every second course, not by cutting in.
 8. Provide three (3) courses of solid masonry under all bearing steel beams and steel joists. Block masonry cores to be filled with grout.
 9. Nonexposed Masonry Units: Where and as indicated on the Drawings, exterior masonry walls that are to be subsequently covered by other finish materials (such as Plaster Veneer Systems,

Membrane Roof Flashing, etc.), shall be provided with “standard (uncolored) medium-texture” concrete masonry units.

E. Integrally Colored Block Masonry Work:

1. Furnish and install all masonry units where shown on Drawings and as required for a complete installation. Use colored mortar for all integrally colored masonry Work.
2. All units shall be laid up in running bond with alternate vertical joints aligned. All horizontal joints shall be kept level. All horizontal and vertical joints shall be uniform in width and thickness and shall not exceed 1/2". All joints exposed in the finish Work shall be tooled slightly concave; all other joints shall be cut off flush.
3. All steel items to be cast in the Work shall be galvanized and shall have a protective coating against corrosion.
4. Lay all masonry units so that only the finished masonry surface is exposed in the finish Work.
5. Start installation of integrally colored solid block masonry one (1) course below grade or more as required by Drawings and/or field conditions.

F. Masonry Anchors and Wall Ties:

1. Contractor's Responsibilities: Structural Steel Contractor shall furnish, and weld specified anchors to steel columns and steel beams, as shown on the Drawings. Masonry Contractor shall furnish and install anchors and/or ties as specified herein, and/or required by field conditions.

G. Wall Reinforcement:

1. General: Provide reinforcing in all concrete masonry block walls.
2. Horizontal Joint Reinforcing: Reinforcing shall be of proper width for wall thickness; shall be centered in wall; installed in first and second bed joints (8" O.C.); in the joint directly over and under openings in the walls; and in every second course of block (16" O.C.) throughout the remainder of the structure, and wherever else shown on the Drawings. Reinforcement in the second bed joint above or below openings shall extend two feet beyond the jambs. Reinforcing is required above and below grade. Reinforcing shall be lapped not less than 6" at ends, and shall be continuous and extended around corners, but shall terminate at either side of relieving and expansion joints. Reinforcement applies to CMU veneer also.
3. Vertical Reinforcing: Install vertical reinforcement bars where shown on the Drawings. Reinforcement shall extend from foundation to full height of wall as indicated on Drawings. Splices may be made only at such points and in such manner that the structural strength of member shall not be reduced. Lapped splices shall provide sufficient lap to transfer the working stress of the reinforcement by bond and shear. Minimum lap shall be 48 bar diameters, unless otherwise noted on the Structural Drawings. Welded or mechanical connections shall develop 125 percent of the strength of the reinforcement.
 - a. Bond Beams: Vertical reinforcement shall be continuous through bond beams.
 - b. Rebar Positioners: Use rebar positioners to ensure accurate placement of vertical reinforcing.
 - c. Mechanical Bar Splicing: Use mechanical bar splice in place of lap splicing for #7 and larger rebars in 8" concrete masonry units.

H. Masonry Control Joints:

1. Masonry control joints shall be "Michigan Type Control Joints", constructed where shown on the Drawings and as per details. The joint shall be continued vertically from the top of the foundation wall to the coping above, maintaining a continuous vertical joint as detailed on the Drawings.
2. Where required by Drawings, install "T" type masonry control joint in the block as the wall is built.

I. Grouting:

1. Fill concrete masonry unit cells solid with grout, as indicated on Drawings and as specified herein.
2. Do not grout for a minimum of four (4) hours after completion of layering Work.
3. Place grout in lifts not exceeding 48 inches. Place grout in 4 foot lifts when total grout pour exceeds 8 feet in height. Provide cleanouts for total grout pours exceeding 5 feet.
4. Grout shall be consolidated by mechanical vibration during placing, in a manner to fill the grout space, before loss of plasticity. Grout pours greater than 12 inches shall be reconsolidated by mechanical vibration to minimize voids due to water loss. Grout pours 12 inches or less in height shall be mechanically vibrated or puddled.
5. When grouting is stopped for one (1) hour or longer, horizontal construction joints shall be formed by stopping the pour of grout not less than 1/2 inch below the top of the uppermost unit grouted.

3.03 HOLLOW UNIT LINTELS

- A. Unless steel lintels are shown, all openings in walls built with hollow units shall have reinforced lintels, formed from masonry lintel units (matching stretcher units in wall) before being placed. Filling of units shall consist of grout, reinforced with #4 steel bars, using two (2) bars, one (1) at top and one (1) at bottom, for each 4" of wall thickness unless otherwise shown on the Drawings.

3.04 BOND BEAMS

- A. Provide bond beams where and as detailed on Drawings. Construct bond beams with course of lintel block. Lintel block shall match adjacent masonry block type and shall be laid to match bond of adjacent masonry.
- B. When block setting mortar has hardened, place and position bar reinforcing steel in the formed void, continuous full length of beam except through control joints, and fill the formed void with grout, consolidated in place by vibration or other methods to insure complete filling void. Screed the concrete fill flush with top of lintel block, and wet cure the beam for three (3) days.

3.05 CMU DRAINAGE SYSTEM INSTALLATION

- A. Install the complete flashing system as indicated on the Drawings in accordance with the manufacturer's recommendations and installation instructions.
- B. Lay the course(s) of block below the required flashing level until above grade. Eliminate this step if the pans are to be laid on a formed concrete foundation above grade.

- C. Install pans by placing two (2) units on each block or evenly along a formed concrete foundation or slab. The drip edge (weep spout) on the pan should extend slightly beyond the base, a molded reference lip on the bottom of the pan should rest against the edge of the block or slab.
- D. Span the continuous row of pans with web spacer/bridge units designed to divert water to the adjoining pans.
- E. Where walls are reinforced, eliminate the pan and bridge at the grouted core. Cross-beds the webs adjacent to the core shall be grouted making sure to overlap the flange. This will prevent grout from spreading beyond the intended core.
- F. Utilize standard mortar spreading techniques with mortar lapped, first over the inner and second over the outer flanges of the pan units. This will stabilize the units during installation and later help divert moisture into the pan.
- G. Reduce clogging from mortar and grout droppings by installing a 2" to 3" layer of pea gravel into the core cavity above the pans. This will suspend mortar droppings and/or insulation in the core allowing moisture to flow down the inside face of the block and into the pan.
- H. Tool all head and bed joints and remove any obstruction from the weep spouts.

3.06 FABRIC FLASHING INSTALLATION

- A. Fabric flashing courses shall be installed in masonry construction as detailed on the Drawings and at the following locations:
 - 1. At top of exterior building foundation walls or beams, extended as a course under the masonry veneer, and up the face of the back-up masonry either 2" above finish earth grades or 8", whichever is greater, through the back-up masonry to 1/2" from the interior wall surface.
 - 2. At lintels and shelf angles supporting exterior masonry, extended as a course over the outstanding leg or flange and 12" up the face of the back-up.
 - 3. At top of concrete slabs supporting exterior masonry, extending as a course over contact surface of member, 4" up interior surface of masonry, and 4" down exterior surface slab edge.
 - 4. At walls penetrating roof line where extended as through-wall course under masonry above, and under the behind sills, to 1/2" from wall surfaces.
 - 5. As indicated and/or noted elsewhere on the Drawings.
- B. Where the flashing is not continuous, such as over and under openings in the wall, the ends of the flashing shall be extended beyond the jamb lines on both sides and shall be turned up into the head joint at each end to form a dam.
- C. Install flashing over a dry, smooth trowel coat of mortar. Trowel mortar level, and do not slope surface of mortar away from wall surface. Set flashing fabric in a 1/2" thick coating of mastic, over mortar bed, with joints between pieces lapped 6" and sealed with mastic.
- D. Weep holes shall be provided with cotton rope fillers not less than 10" long in vertical joints directly above horizontal portion of the flashing at exterior masonry wythes, spaced 32" on centers for concrete block.
- E. Spandrel flashing shall not project beyond exposed face of exterior mortar joints.

3.07 CAVITY MESH AND WEEP VENTS INSTALLATION

- A. Match product size to cavity size. Clean flashings and weep holes so they are free of mortar droppings and debris immediately prior to installing "Cavity Mesh" and "Weep Vents". Install specified products in accordance with the manufacturer's specifications.
- B. Weep holes shall be provided with cotton rope fillers not less than 10" long in vertical joints directly above horizontal portion of the flashing at exterior masonry wythes, spaced 32" on centers for concrete block. Fill block masonry with pea gravel where indicated on the Drawings.

3.08 OPENINGS, HOLES AND CHASES

- A. Provide all openings, holes and chases in masonry as shown on the Drawings, and as required for Work of Mechanical and Electrical Trades. Work shall be accurately located by the trade requiring same, but mason shall not construct such parts without giving other trades due notice and opportunity to lay out such Work.
- B. After Work of other trades is complete, fill all openings, holes, or chases with material similar to adjacent surfaces.

3.09 SETTING AND BUILDING-IN

- A. General: Build-in materials occurring in masonry and concrete construction, shown or specified to be furnished by other trades. All built-in Work shall be accurately placed, securely held in position and located as directed, in all cases.
- B. Other Materials: Where specified or indicated on the Drawings, set other material as part of Work.
- C. Steel and Iron Items: Set and build-in steel and iron items, such as downspout guards, lintels, seat angles, sleeve inserts and anchors.
- D. Anchors and Bolts: Unless otherwise specified, set and build in anchors and bolts required for the attachment of Work of other trades to masonry.
- E. Hollow Metal Door Frame Assemblies: Receive pressed steel door frame assemblies from Hollow Metal Door and Pressed Steel Frames Contractor, set and build-in, complying with the current edition of ANSI/SDI A250.11 (formerly SDI-105) "Recommended Erection Instructions for Steel Frames". Locate wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding height on strike jamb. Fill space between pressed steel frame and masonry solidly with grout as specified herein.

3.10 CLEANING AND POINTING

- A. General: Remove all mortar, dirt or paint spots; and point up all joints full and even. After mortar is thoroughly set and cured, clean masonry completely using the least harsh method possible. Thoroughly clean all concrete masonry block units. In general, use only wood paddles and fiber brushes with clean water and soap for cleaning. Thoroughly flush the surface with clean water after cleaning.
- B. Exposed Masonry: All exposed masonry surfaces shall be dry brushed cleaned as the Work progresses and at completion, all spots and dirt shall be removed, and joints pointed where necessary.
- C. Prohibited Cleaning Methods:
 - 1. The use of high pressure washing, wire brushes, or other abrasives is prohibited.
 - 2. Use of incompatible undiluted acids or alkali cleaning agents will not be permitted.

D. Pointing and Caulking:

1. When ready for pointing, the joints shall be dampened and carefully pointed to a slight concave unless otherwise specified. No pointing shall be done in freezing weather nor in locations exposed to hot sun, unless properly protected. Pointing mortar shall be composed of 1 part non-staining cement, 1 part hydrated lime (Type S) and 4 parts clean, washed sand. Coloring pigments may be added as required, with color of pointing mortar as approved by the Architect, before proceeding with pointing.
2. Head joints in copings and similar cast stone units shall be caulked with a joint sealant used in accordance with the manufacturer's recommendations.

E. Cleaning Products and Methods: Masonry cleaning products as recommended and approved by the accepted masonry unit manufacturer may be used and shall be subject to review by the Architect. Cleaning products shall be suitable and compatible with the type and color of masonry units as noted on the Drawings, and as specified herein.

1. Acceptable Cleaning Product Manufacturer: PROSOCO, Inc., 3741 Greenway Circle, Lawrence, KS 66046, (800)255-4255 or (785)865-4200; <http://www.prosoco.com>.
2. General: Method of surface preparation, surface and air temperature conditions, equipment to be used, storage and handling, and application, shall be in strict accordance with the cleaning product manufacturer's printed specifications and/or instructions.
3. Protection: All means shall be taken to protect adjacent surfaces from cleaning operations. Protect non-masonry surfaces from contact with cleaning solution by covering them with liquid strippable masking agent as recommended by the cleaning product manufacturer, polyethylene film, or waterproof masking tape.

F. Debris and Waste Materials: During progress of the Work, upon completion of Work, and before final acceptance of the Work, keep the free of debris and waste materials resulting from Work of this section. Remove all construction debris and rubbish to central area designated by General Contractor, for general clean-up by General Contractor, or if directed by General Contractor to remove from the site and legally dispose.

G. Unused Materials, Tools, and Equipment: Upon completion of Work and before final acceptance of the Work, remove all unused materials, tools, and equipment from the site.

END OF SECTION

SECTION 05 40 00COLD-FORMED METAL FRAMING

The requirements of the "General Conditions", the "Supplementary Conditions", and "Division 1" sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, equipment, and services necessary for Exterior Cold-Formed Metal Framing Work indicated on the Drawings and specified herein. Work includes, but is not limited to the following:
 - 1. Load Bearing, Structural Metal Stud Framing.
- B. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:
 - 1. Masonry - Section 04 20 00.
 - 2. Miscellaneous Metal Work - Section 05 50 00.
 - 3. Rough Carpentry - Section 06 10 00.
 - 4. Thermal Insulation - Section 07 21 00.
 - 5. Plaster Veneer System - Section 07 24 00.
 - 6. Entrances and Storefronts - Section 08 41 00.
 - 7. Gypsum Board Sheathing - Section 09 29 00.
 - 8. Metal Building Systems - Section 13 34 19.

1.02 APPLICABLE STANDARDS

- A. Codes and Reference Specifications: Except as otherwise specified herein, materials and workmanship shall conform to the following current codes and specifications.
 - 1. American Institute of Steel Construction, Inc., AISC Steel Construction Manual.
 - 2. American Welding Society (AWS):
 - a. D1.1, Structural Welding Code - Steel.
 - b. D1.3, Structural Welding Code - Sheet Steel.
 - 3. American Iron and Steel Institute (AISI) - North American Specification for the Design of Cold-Formed Steel Structural Members, 2007 Edition With Supplement No. 2.

4. ASTM International Standard Specifications:
 - a. ASTM A653 - Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process. (Formerly ASTM Standard A446).
 - b. ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 - c. ASTM A1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened and Bake Hardenable. (Formerly ASTM Standard A611).
 - d. ASTM A1011 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength. (Formerly ASTM Standard A570).
 - e. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
 5. Connections tested per American Iron and Steel Institute (AISI) Standards.
 6. All applicable governing Rules, Regulations, Building Codes and Ordinances.
- B. The following minimum factors of safety shall be applied to the ultimate values of fastenings:
1. Welded Connections: Per AISI and AWS.
 2. Powder Driven Fasteners into Steel: 5.0.
 3. Powder Driven Fasteners into Concrete: 10.0.
 4. Drilled, Tapped-In, and/or Expansion Anchors: 5.0.
 5. Self-Tapping Screws: 4.0.
 6. Pop Rivets: 4.0.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Member in good standing of the Steel Framing Industry Association (SFIA).
 1. Products to be certified under an independent third party inspection program administered by an agency accredited by IAS to ICC-ES AC98 IAS Accreditation Criteria for Inspection Agencies.
- B. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
- C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this project in material, design, and extent.
- D. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

- E. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-steel thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- F. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Framing Industry Association (SFIA).
- G. Environmental Requirements: Paint products such as touch-up field painting and isolation coatings shall comply with all applicable Federal and State Regulations on Volatile Organic Compounds (VOC).

1.04 CERTIFICATION OF WELDERS

- A. PRIOR to starting Work, furnish to the Architect, valid certification qualified by a recognized, independent laboratory, for all welders working on fabrication and erection. All welding shall be performed by welders who have qualified by tests in accordance with AWS "Standard Qualification Procedure" of the American Welding Society (AWS), to perform the type of Work required.

1.05 SUBMITTALS

- A. General: Prior to fabrication of framing, the Contractor shall submit Shop Drawings and Product Data, including fabrication and erection drawings, to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
 - 1. Include placing drawings for framing members showing size and gauge designations, number, type, location and spacing. Indicate supplemental strapping, bracing, splices, accessories, and details required for proper installation. Design and detail all connections to structural steel, structural concrete, and/or masonry.
 - 2. Indicate all member gauges, spacings and sizes. Sizes and spacings shown on the Drawings are minimums, Contractor shall design all members. Contractor shall increase gauge or decrease spacings to comply with actual design load requirements.
 - 3. All Shop Drawings and calculations shall be sealed by a Professional Structural Engineer licensed in the State of the proposed Project with a minimum of five (5) years experience in the design of light gauge framing.
- B. Structural Calculations: Submit full structural calculations indicating loads, stresses and deflections for members and connections.

1.06 QUALITY CONTROL

- A. Testing Agency Services: Contractor may engage at his expense, a separate testing agency for information and guidance, to ascertain that all new materials are furnished, fabricated, installed, or erected in accordance with all requirements of the Contract Documents.
- B. Inspection Reports: Testing agency shall send periodic reports of the findings of all inspections to the Architect, Owner, and General Contractor.
- C. Defective Materials: Promptly replace all defective materials and workmanship, to the satisfaction of the Architect, at no cost to the Owner.

1.07 DELIVERY AND STORAGE

- A. Delivery: Deliver to the site, all materials in protective wrappings, clearly labeled with all pertinent information to facilitate checking. Unload in areas designated by the General Contractor.
- B. Storage: Store materials at the site off the ground and in properly protected dry storage facilities, until ready for use.

1.08 DAMAGE TO MATERIALS

- A. Use care in storing, handling and erecting all material, and support material properly at all times to insure that no piece is bent, twisted or otherwise damaged. Material damaged due to carelessness shall be corrected at Contractor's expense, to the approval of the General Contractor, before being erected.

1.09 SCAFFOLDING

- A. Furnish, erect, and maintain all scaffolding and ladders in accordance with the standards of all governing local, state, and national safety codes. Equipment shall be erected at times and locations so as not to delay any part of Work. When no longer required, promptly dismantle equipment and remove from the site.

1.10 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period and any damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance of the installation.

PART 2 - PRODUCTS

2.01 DESIGN

- A. Cold-formed metal framing systems shall be designed by a Professional Structural Engineer registered in the State of the proposed Project. Drawings for the design of the cold-formed metal framing systems shall also be sealed by the same Engineer.
- B. Design, analysis and computation of section properties shall be in accordance with the American Iron and Steel Institute (AISI) - North American Specification for the Design of Cold-Formed Steel Structural Members, 2007 Edition.
- C. Technical tabulations of section properties and load capacities shall indicate dimensions, steel characteristics and allowable stresses upon which computations are based.
- D. Framing systems shall be designed for applicable wind loads, with consideration for additional loading at eaves, corners, and overhangs. Design shall meet Building Code requirements for uplift resistance and wind load.
- E. Design Parameters: Refer to the Structural Drawings.

2.02 MATERIALS

A. Manufacturers:

1. ClarkDietrich™ Building Systems, 9100 Centre Pointe Drive, Suite 210, West Chester, OH 45069, (800)543-7140 or (513)870-1100; www.clarkdietrich.com.
2. Marino/Ware, 400 Metuchen Road, South Plainfield, NJ 07080, (908)757-9000 or (800)627-4661; www.marinoware.com.

B. Framing Systems: Framing system shall include, but not necessarily be limited to “C” type studs and/or SJ type studs with minimum 1-5/8" flange width and 1/2" stiffening ribs, of sizes and lengths noted on Drawings, with mating runner track and required erection accessories such as strapping, and clip angles, of galvanized steel. Unless stud members of greater strength are noted on Drawings, stud members shall be of such design as to be capable of resisting wind loading designed per Building Code required in the State of the proposed Project, and in accordance with the current AISI recommendations, with a maximum allowable deflection of L/600 at masonry veneer construction, L/360 at all other locations, and a minimum of 12.5 mm (0.5 in.) deflection in either vertical direction up or down. Use not less than 18 gauge studs behind masonry veneer.

C. Framing Members, General: Comply with ASTM C 955 for conditions indicated.

D. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: As required by structural performance.

E. Steel Sheet for Clips: ASTM A 1003/A 1003M, ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.
2. Coating: G90 (Z275).

F. Vertical Deflection Clips: Manufacturer's standard clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

G. Fastening Devices: Materials shall include electro-galvanized self drilling, self tapping, sheet metal screws of size required by calculations, plated expansion anchors to structural substrate, of size required by calculations. Use only drilled in anchors at connections to concrete and/or masonry.

H. Physical and Structural Properties: The physical and structural properties listed by ClarkDietrich™ Building Systems, shall be considered the minimum permitted for all framing members.

2.03 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.

3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers and knee braces.
9. Hole-reinforcing plates.
10. Backer plates.

2.04 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, threaded carbon-steel, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated: with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction.
 1. Uses: Securing cold-formed steel framing to structure.
 2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
 3. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594 (ASTM F 836M).
- D. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.05 MISCELLANEOUS MATERIALS

- A. Cement Grout: Portland cement, ASTM C 150/C 150M, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- B. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C 1107/C 1107M, and with a fluid consistency and 30-minute working time.

- C. Shims: Load-bearing, high density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.
- D. Sealer Gaskets: Closed-cell neoprene foam, ¼ inch (6 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

PART 3 - EXECUTION

3.01 SHOP AND FIELD INSPECTION

- A. Testing Agency Services: The Owner will secure the services of an unbiased, qualified, and recognized commercial Testing Laboratory, to inspect all Cold-Formed Metal Framing Work at the shop and in the field, and will pay all costs involved, except inspection costs due to reinspection of items found defective on the initial Owner sponsored inspection. Reinspection costs shall be born by the Contractor.
- B. Shop Inspection: Include examination of the following Work.
 - 1. Verify that only new materials are provided.
 - 2. Conformance of Work with Specifications, including specified tolerances.
- C. Field Inspection: Include examination of the following Work.
 - 1. All members before erection to verify they have not been damaged in shipment, and are being properly stored on the site.
 - 2. All members after erection to verify proper position.
 - 3. All welds to verify proper execution, cleanliness, type, size, and strength.
- D. Reports of Inspection: The Testing Laboratory shall send periodic reports of the findings of all inspections to the Architect, Owner's Representative, and General Contractor within seven (7) days of inspection.
- E. Cooperation: Contractor shall cooperate fully with the Testing Laboratory in the execution of the Testing Work.

3.02 INSPECTION

- A. Examine conditions under which the Work is to be performed and notify the General Contractor in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.03 FABRICATION AND ERECTION

- A. Fabricate and erect cold-formed metal framing at exterior walls, and where shown on Drawings. All Work shall be in accordance with Drawings, approved Shop Drawings, manufacturer's recommendations, and as specified herein.
- B. Install cold-formed steel framing in accordance with ASTM C 1007 and AISI S200 "North American Standard for Cold-Formed Steel Framing - General Provisions", and manufacturer's written instructions unless more stringent requirements are indicated.

- C. Cut all framing components squarely, or at angle as in bracing, to fit squarely against abutting members. Firmly hold members in position until properly fastened.
- D. Anchor track securely to bottom and to overhead steel framing structures as indicated on Drawings. Use butt welds or splices at all butt joints in the track.
- E. Install studs at spacings indicated on Drawings. Where stud spacings are not indicated, space in accordance with manufacturer's recommendations to sustain without axial load, the design wind load and maximum deflection as specified herein or shown on the Design Drawings.
 - 1. Seat studs squarely in the track, with the stud web and flanges abutting the track web, plumb and aligned, and securely attach to the flanges or web of both the upper and lower tracks, both sides.
 - 2. Splices in studs will NOT be permitted.
 - 3. Corners of stud walls shall be provided with three (3) studs minimum, located so as to provide surfaces for attachment of all interior and exterior facings.
- F. Bridging shall be furnished and installed in wall systems as indicated on Drawings, and to manufacturer's specifications and/or recommendations.
- G. Where non-structural sheathing is specified or indicated on Drawings, furnish and install lateral bracing in framing systems to manufacturer's specifications or recommendations. Where structural sheathing, such as plywood, is specified on Drawings, omit lateral bracing, except for erection purposes and stability before attachment of sheathing.
- H. All accessories shall be furnished and installed as required for a complete and proper installation, in strict accordance with manufacturer's recommendations.
- I. Fasten framing components with self-drilling, self-tapping screws, or by welding. Screws or welds shall be of sufficient size to insure the strength of the connection. Welds shall be fusion welds, including fillet welds, butt welds, plug welds and arc-spot welds (puddle welds), and shall be in accordance with the latest recommended procedures and practices of the American Welding Society (AWS).
- J. Touch-Up Field Painting: Touch-up all damaged areas of galvanized coating, including field abrasions and welds, with zinc-rich galvanized coating repair paint according to ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings. Provide nylon/polyester or natural bristle brush application of paint product in accordance with the manufacturer's recommendations and instructions. Surfaces shall be dry, free from oil, dirt, dust, mill scale or other contaminants to ensure adequate adhesion.
 - 1. Galvanized Coating Repair Paint: Zinc Clad® VI Water Based Organic Zinc-Rich Epoxy such as manufactured by The Sherwin-Williams® Company, Cleveland, OH, (800)321-8194; www.sherwin-williams.com.
- K. Isolation Coatings: Wherever studs, or plates of cold-formed metal framing are to be secured to or be in contact with masonry or concrete, paint the metal contact surface with two (2) heavy coats of paint product as specified herein, or comparable equivalent product subject to review by the Architect. Allow all paint to dry thoroughly prior to installation of Metal Framing Work. Exposed to view surfaces shall be clean and free of isolation coating.
 - 1. Manufacturer: Paint product specified herein shall be such as manufactured by The Sherwin Williams® Company, Cleveland, OH, (800)321-8194 or (800)474-3794; www.sherwin-williams.com.

- a. Paint Product: Macropoxy® 646 Fast Cure Epoxy, B58.

3.04 FIRE PREVENTION

- A. Precautions: When welding and/or cutting with burning torches is required, take all precautions to prevent damage to building(s) from fire, weld spatter, dripping molten metal, smoke and fumes, or other causes arising from the operations. Provide fireproof tarpaulins or enclosures around the areas of welding or burning.
- B. Equipment: Furnish adequate and sufficient fire-fighting equipment and extinguishers to prevent damage and fire at each location where welding or burning is to be done.

3.05 DAMAGE TO ADJACENT CONSTRUCTION

- A. Contractor shall be responsible for any damage to adjacent construction in place, caused by the Work of this section. Repair all damage at own expense, to the satisfaction of the Architect.

3.06 CLEAN-UP

- A. Work Required: Clean-up any Work soiled in the performance of the Work of this Trade.
- B. Debris and Waste Materials: During progress of Work, upon completion of Work, and before final acceptance of Work, keep the premises free of all scrap, construction debris and waste materials resulting from Framing Work. Remove construction debris and rubbish to area designated by General Contractor, for general clean-up by General Contractor, or if directed by General Contractor to remove from the site and legally dispose.
- C. Unused Materials, Tools, and Equipment: Upon completion of Work and before final acceptance of the Work, remove unused materials, tools, and equipment from the site.

END OF SECTION

SECTION 05 50 00MISCELLANEOUS METAL WORK

The requirements of the "General Conditions", the "Supplementary Conditions", and "Division 1" sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide and/or furnish all labor, materials, equipment, apparatus, tools, transportation, protection, and services necessary for Miscellaneous Metal Work and related items as indicated on the Drawings and specified herein.
- B. Examination: Carefully examine the Drawings and Specifications and include all Miscellaneous Metal Work not distinctly specified in other sections, or noted on the Drawings as being provided by other Trades.
- C. Miscellaneous Metal Products: No attempt is made to enumerate or describe each item of the Work, but simply to describe major items, certain special items, and general construction requirements for all items. Work includes, but is not necessarily limited to the following, or other items as indicated on the Drawings and/or specified herein.
 - 1. Anchors.
 - 2. Anchor Bolts and Pipe Sleeves.
 - 3. Lintels.
 - 4. Steel Guard Posts - furnish.
 - 5. Steel Angles at Safety Lane Pit - furnish.
 - 6. Steel Channel for Dock Levelers - furnish.
 - 7. Access/Emergency Egress Ladder - furnish and install.
 - 8. Building Light Fixture Post - furnish and install.
 - 9. Exterior and Interior Steel Stair Construction - furnish and install.
 - 10. Steel highway Type Guardrail.
 - 11. Steel Pipe Railing Assemblies.
 - 12. Trench Drain Grate.
- D. Door and Frame Schedule: Refer to the Drawings.
- E. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:
 - 1. Concrete Reinforcing - Sections 03 00 50 and 03 30 00.

2. Installation of Steel Guard Posts and Channels for Dock Levelers - Section 03 30 00.
3. Rough Carpentry - Section 06 10 00.
4. Prefinished Sheet Metal Work - Section 07 60 00.
5. Hollow Metal Doors and Pressed Steel Frames - Section 08 11 13.
6. Overhead Coiling Doors - Section 08 33 23.
7. Finish Hardware - Section 08 70 00.
8. Framing for Gypsum Board Partition Framing - Section 09 29 00.
9. Field Finish Painting - Sections 09 91 13 and 09 91 23.
10. Loading Dock Equipment - Section 11 13 00.
11. Metal Building Systems - Section 13 34 19.

F. Work Furnished But Not Installed:

1. Items anchored (not bolted) to Concrete and Masonry Work.
2. Items as specified herein for installation by others.

1.02 DESIGN REQUIREMENTS

- A. Structural Performance of Handrails and Railing Systems: Design, engineer, fabricate, and install handrails and railing systems to comply with requirements for ASTM Standard E985 for structural performance, based on testing performed in accordance with ASTM Standards E894 and E935.
- B. Accessibility Guidelines: Handrails required to be accessible to persons with disabilities shall comply with Title III of The Americans with Disabilities Act (ADA), Public Law 101-336.

1.03 QUALITY ASSURANCE

- A. Reference Specifications: Except as otherwise specified herein, materials and workmanship shall conform to the following current specifications as amended to date.
 1. All applicable Local Building Codes and Ordinances.
 2. "Specifications for Structural Steel Buildings", as adopted by the American Institute of Steel Construction (AISC), June 22, 2010.
 3. American Welding Society (AWS), D1.1, Structural Welding Code - Steel.
 4. ASTM A6 – Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
 5. "Standard Specifications for Open Web Steel Joists" as adopted by the Steel Joist Institute (SJI) and the American Institute of Steel Construction, Inc., (AISC).
- B. Environmental Requirements: Paint products shall comply with all applicable Federal and State Regulations on Volatile Organic Compounds (VOC).

- C. Steel Pipe Railings: Fabricator shall engineer and fabricate railings to withstand design loads.

1.04 CERTIFICATION OF WELDERS

- A. Current and valid certification qualified by a recognized, Independent Laboratory shall be furnished to Architect for all welders working on fabrication and/or erection PRIOR to starting Work. All welding processes and welding operators shall be performed by welders who have qualified by tests in accordance with AWS "Standard Qualification Procedure" of the American Welding Society (AWS) to perform the type of Work required.

1.05 SUBMITTALS

- A. General: Submit Shop Drawings and Product Data to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Shop Drawings:
1. Provide complete Shop Drawings showing all items to be provided, and submit reproducible to the Architect for review.
 2. Contractor shall prepare completely detailed Shop Drawings showing details for cutting, fabricating, and connecting all pieces. Do not duplicate Design Drawings for use as Shop Drawings. Duplication of Design Drawings shall be grounds for rejection.
 3. Shop Drawings shall show all locations, markings, quantities, materials, sizes, and shapes and indicate all methods of connection, anchoring, fastening, bracing, and attaching to the Work of other Trades.
 4. Where connections are not shown on the Drawings, connections shall be designed and detailed on the Shop Drawings, and sealed by a Registered Professional Structural Engineer in the State of the proposed Project, retained and paid by the steel fabricator.
 5. Provide separate Shop Drawings for erection.
 6. Prepare Shop Drawings in accordance with "AISC - Detailing for Structural Steel", latest edition, using a marking system compatible with, and referenced to, the marking system used on the Design Drawings.
 7. Indicate welding by using AWS symbols, showing type, size and location of all welds. Provide auxiliary views of welds as required to clarify the welded connections.
 8. Formally check all Shop Drawings before forwarding to Architect.
- C. Product Data: Submit Product Data as required for each manufacturer's factory/shop fabricated product specified under Work of this section.
- D. Reports: Submit test reports, procedure specifications and certifications as required to substantiate welded connections design and welding qualifications to the Owner's Representative and the General Contractor for review.

1.06 QUALITY CONTROL

- A. Testing Agency Services: Contractor may engage at his expense, a separate testing agency for information and guidance, to ascertain that all new materials are furnished, fabricated and installed in accordance with all requirements of the Contract Documents. The testing agency shall send reports of all inspections to the Architect, Owner, and General Contractor.

1.07 PRODUCT HANDLING

- A. Stack and store steel above ground on platforms, studs, or other supports. Protect steel from corrosion and damage. Keep materials clean.
- B. Store other materials in a weathertight, dry place until ready for use.
- C. Store packaged materials in their original, unbroken package or container.

1.08 PROJECT CONDITIONS

- A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.09 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance of the installation.

PART 2 - PRODUCTS

2.01 MISCELLANEOUS STEEL SHAPES AND MATERIALS

- A. Exposed to View Fabrications: For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- B. Steel Rolled Plates and Shapes: Fabricated from new open hearth structural steel conforming to ASTM A36 - Standard Specification for Carbon Structural Steel.
- C. Steel Pipe: ASTM Standard A53; Type S, Grade A, Schedule 40, unless otherwise noted.
- D. Steel Tubing: Cold rolled, electric resistance welded, carbon steel, hollow, structural steel tubing, fabricated from steel having properties complying with ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- E. Hi-Tensile Bolts: Heavy hex type structural bolts conforming with ASTM Standard A325, with matching heavy hex type nuts, 3/4" minimum diameter, of lengths required for connections, with hardened steel washers.
- F. Standard Bolts and Anchor Bolts: Unfinished bolts conforming to ASTM Standard A307; Grade A, with hexagon heads and nuts where exposed in the finish Work.
- G. Expansion Bolts: Hilti® Kwik Bolt 3 Expansion Anchor as manufactured by Hilti, Inc., 5400 South 122nd. East Avenue, Tulsa, OK 74146, (800)879-8000 or (918)252-6000; www.us.hilti.com.
 - 1. Comparable Products: Expansion bolts by the following manufacturer with comparable products of equivalent capacity may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.

- a. Power-Stud+SD1 as manufactured by Powers Fasteners, Inc., 2 Powers Lane, Brewster, NY 10509, (800)524-3244 or (914)235-6300; www.powers.com.
- H. Welding Electrodes: Series E-60 or E-70, AWS A5.1 or A5.5.
- I. Galvanizing: Provide zinc coating where indicated on the Drawings or required by field conditions. Galvanizing shall be in accordance with ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products and/or ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; not less than 1.25 oz./sq.ft.
- J. Priming Paints: Provide one (1) of the following manufacturers and products, "lead and zinc chromate free" rust inhibiting priming paint, subject to review by the Architect. Substitutions will not be permitted.
 - 1. Manufacturers:
 - a. International Protective Coatings, Devoe® High Performance Coatings, Strongsville, OH, (888)338-6347; www.international-pc.com.
 - b. PPG Architectural Finishes, 400 S. 13th Street, Louisville, KY 40203, (800)441-9695; www.ppg.com.
 - c. Tnemec Company, Incorporated, 6800 Corporate Drive, Kansas City, MO 64120, (800)863-6321; www.tnemec.com.
 - 2. Ferrous Metal Paint Product:
 - a. International Protective Coatings, Devoe® High Performance Coatings, Devshield® 4130 Rust-Penetrating Metal Primer, Light Gray.
 - b. PPG Architectural Finishes, PPG High Performance Coatings™ (HPC), SPEEDHIDE® Int/Ext Rust Inhibitive Steel Primer 6-208 Red.
 - c. Tnemec Company, Incorporated, Tnemec Primer Series 10, 99 Red.
 - 3. Galvanized Steel Paint Product:
 - a. International Protective Coatings, Devoe® High Performance Coatings, Devguard® 4160 Multi-Purpose Tank & Structural Primer, White.
 - b. PPG Architectural Finishes, PPG High Performance Coatings™ (HPC), SPEEDHIDE® Int/Ext Galvanized Steel Primer 6-209, White.
 - c. Tnemec Company, Incorporated, Hi-Build Epoxoline® Series 66, White.

2.02 CONNECTIONS AND WORKMANSHIP

- A. General: Weld all shop connections, bolt or weld all field connections unless otherwise noted or specified. Provide all clips, lugs, brackets, straps, plates, bolts, nuts, washers, required for complete fabrication and erection. Use connections of type and design required by forces to be resisted, and to provide secure fastening. Shop welded steel bolts shall be welded to sides and bottom of steel members, not at top of member.
- B. Bolting: In bolting, draw-up bolts or nuts tight, and deform threads where possible. Use bolts of lengths required so that bolts do not project more than 1/4" beyond face of nut. Do not use washers unless specified.

C. Welding:

1. Perform all welding by the electric arc method, in accordance with the recommendations of the American Welding Society (AWS). Welds shall be solid and homogeneously a part of the metals joined, free from pits or incorporated slag or scale. Surfaces of weld shall be smooth and regular, and shall be of full area indicated or required to develop the required strength of the joint.
2. Only welders and welding operators who have been tested and certified in accordance with Appendix A, AWS D1.0, and the applicable provisions of AWS D1.0 will be permitted. All operators shall pass all applicable qualification tests while in the current and continuous employment of the fabricator or erector regardless of previous qualifications and certifications.
3. Perform all shop and field welding by the shielded metal-electric arc process. Use qualified welders. Provide all necessary jigs and holding devices for shop welding. Dog or clamp down all Work to prevent distortion during welding.
4. Design weld details and procedures so as much shop Work as possible is performed in the flat and horizontal position. Avoid undercutting, insufficient throat or leg, lack of fusion and splattering. Prepare welding procedure specifications and diagrams for each weld joint, and use in the Work. Assign each joint a procedure designation number or code. Show the number or code in the tail of each welding symbol in the Shop Drawings. Qualify non-prequalified welds in accordance with Appendix A, AWS D1.0. Where a standard weld type is repeated throughout the Work, the procedure designation or code may be indicated by general note or reference on each Shop Drawing where that weld type appears.
5. Make fillet welds larger than 5/16" in not less than two (2) passes. After each pass, remove the slag coating entirely before starting next pass. Do not use fillet welds smaller than 1/4" unless the thickness of the connected material requires the use of 3/16" weld. Add approximately 3/4" to the theoretical length of all intermittent welds as an allowance for craters. Fill all craters.
6. Structural welds shall not be less than 3" in length unless otherwise approved on Shop Drawings.
7. Welds of all metal fabrications exposed in the finish Work shall be ground smooth, flush with adjacent surfaces, filleted at angular connections, and suitably prepared for final finish painting, unless otherwise specified.

D. Galvanized Steel Products: Field touch-up all damaged areas of galvanized coating, damaged during erection including field abrasions and welds, with zinc-rich galvanized coating repair paint according to ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings. Provide nylon/polyester or natural bristle brush application of paint product in accordance with the manufacturer's recommendations and instructions. Surfaces shall be dry, free from oil, dirt, dust, mill scale or other contaminants to ensure adequate adhesion.

1. Galvanized Coating Repair Paint: Zinc Clad® VI Water Based Organic Zinc-Rich Epoxy, such as manufactured by The Sherwin-Williams® Company, Cleveland, OH, (800)321-8194; www.sherwin-williams.com.

E. Holes for Connections of Work by Others: Provide all holes required for the connection of the Work of other Trades where noted on the Drawings, or determined prior to fabrication of the steel.F. Finished Work: Any Work not presenting a finished appearance will be rejected. Furnish all members true to length so assembling may be done without fillers, except where required as detailed. Trim projecting edges or corners flush where different members are assembled. All items shall be free from twists, bends, and joints. Cope, block, and miter joints carefully and neatly. Clip projecting corners. Trim all filler pieces flush.

2.03 PAINTING (SHOP AND FIELD)

- A. Miscellaneous (steel) metal shall be shop prime painted and field touched-up using paint as specified herein.
- B. Before steel leaves shop and before shop painting, thoroughly remove and clean all surfaces of all dirt, grease, loose mill scale, rust and foreign matter. All surfaces not in contact but inaccessible after assembling shall have two (2) coats before assembling. Surfaces in contact after assembling need have no paint. Do not paint surfaces at places to be welded. All finished pieces shall have one (1) prime coat before leaving the shop.
- C. After erection, clean all foreign material off the steel, and if paint is removed, repaint to meet requirements of original prime coatings.
- D. After all miscellaneous (steel) metal Work has been installed and accepted, touch-up all abraded surfaces, including field bolts and welded areas.
- E. Furnish the General Contractor with copies of invoice for paint, and allow manufacturer's representatives and General Contractor full access to the paint shop to inspect the paint.

2.04 ANCHORS

- A. Provide anchors for miscellaneous iron members anchored into concrete. Fabricate anchors from strap iron, bent to shape, welded to backs of members, extended with bent end for building-in as conditions require, of sizes and spacing as noted. Where size and spacing are not noted, furnish 1-1/2" x 1/4" size anchors for concrete. Unless otherwise noted on the Drawings, space anchors 3'-0" or less on centers.
- B. Where anchors and plates or clips are to be built-in for attachment of later Work, provide bolts in the plates or clips, welded to back, with threaded ends extended as required.
- C. For attaching Work to concrete, where anchors or inserts cannot be built-in, provide approved type of cinch anchors and machine bolts or screws.

2.05 ANCHOR BOLTS AND PIPE SLEEVES

- A. Furnish to Concrete Contractor for installation, miscellaneous anchor bolts and pipe sleeves as indicated and/or required, including all markings, setting diagrams, templates. Steel Contractor shall drill all holes required for anchor bolts and through-bolts detailed not to be built-in.
- B. Furnish to Concrete Contractor for installation, pipe sleeves as indicated and/or required, including all markings, setting diagrams, and templates.

2.06 MISCELLANEOUS STEEL FRAMES AND CURBS

- A. General: Furnish steel frames and curbs in accordance with the Drawings and as specified herein, to Concrete Contractor for setting.
- B. Fabrication: Steel frames for door and other miscellaneous openings, and steel curbs throughout shall be built-up of rolled steel plate or structural sections as noted, with connections to adjoining Work, and anchors for building into masonry and/or concrete as required. All sections shall be selected for trueness of web and flange, straightened as required so that the finished frames are uniform, square and true throughout the length and depth of the assembled units and that curbs are straight and true.

- C. Assembly: Frames shall be assembled by riveting or welding, but rivets may not be used on exposed surfaces. Built-up members of frames shall be connected by means of plug welding or continuous welding. Exposed edges of member shall be welded continuously. Frames and lintel members shall be welded together where so noted and shown. All exposed welding shall be ground smooth.
- D. Door Frame Jambs in Concrete: Provide 1-1/4" x 3/16" steel strap anchors on back, vertically adjusted, 2'-0" on centers maximum for building into concrete and clip angle at bottom for bolting into concrete; and shall be fitted with temporary spreader bars at bottom to hold frame in shape during shipping and erection.
- E. Steel Frames and Curbs in Concrete Work: Provide 1-1/2" x 1/4" steel strap anchors on back, extended for building-in, spaced not over 3 ft. on centers, but not less than two (2) per side.

2.07 GUARD POSTS

- A. Pipe Guard Posts: Furnish all steel pipe guard posts and steel pipe bases for sign posts of lengths as noted on the Drawings, and deliver to the Concrete Contractor for filling with concrete and setting. Posts shall be long straight sections, ASA Schedule No. 40 standard strength structural steel black pipe as indicated on the Drawings, with ends cut off square, and with burrs removed, and with welded steel closure plate at bottom.
- B. Pipe Sizes: Include the following, unless otherwise indicated on the Drawings.
 - 1. 8" nominal diameter (actual 8.625" O.D. x 28.55 P.L.F.).
 - 2. 6" nominal diameter (actual 6.625" O.D. x 18.97 P.L.F.).

2.08 TRUCKDOCK STEEL CHANNEL EDGES

- A. Provide structural steel channel edges at truckdocks to Concrete Contractor for anchorage to concrete, refer to Structural Drawings for size.

2.09 STEEL PIPE RAILING ASSEMBLIES

- A. Fabrication: Fabricate railings, from ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; Type S-Seamless, Grade A, Schedule 40 steel pipe, made up in flush welded construction, as detailed on Drawings. Wall railings shall be single member; all other railings shall be multi-member construction, as detailed on Drawings.
- B. Assembly: Railings shall be assembled as shown on the Drawings and by coping the members together and welding perimeter of joints continuously. Grind or file welds smooth and neatly filleted. Top rails shall be continuous and shall be formed as shown on the Drawings down at ends to form vertical end posts. Posts shall be vertical, rails level or parallel to slope of supports. Provide suitable prefabricated preformed fitting inserts for all bends and turns where change in direction of members occur. Provide flanged fittings where rails terminate at walls.
- C. Handrails: Installed railings shall be designed and constructed for a concentrated load of 200 pounds applied at any point and in any direction, and a uniform load of 50 pounds per foot applied in any direction. The concentrated and uniform loading conditions shall not be applied simultaneously.
- D. Guardrails: Design and construct for a concentrated load of 200 pounds applied at any point and in any direction along the top railing member. Guardrails shall also be designed and constructed for a uniform load of 50 pounds per foot applied horizontally at the required guard height and a simultaneous uniform load of 100 pounds per foot applied vertically downward at the top of the ground. The concentrated and uniform loading conditions shall not be applied simultaneously.

- E. Securement to Steel: Permanent railings shall be secured to steel with attaching plates welded to bottom of posts. Secure railing assemblies in place by welding to framing.
- F. Installations in Concrete: Furnish railings with steel post sleeves as specified herein for railing installations not provided by others.
- G. Securement to Concrete: Railing posts shall be secured to concrete surfaces with anchor plates and base plate flanges as specified herein.
 - 1. Manufacturer: Products specified herein shall be as manufactured by R & B Wagner, Inc., 10600 West Brown Deer Road, Milwaukee, WI 53224, P.O. Box 423, Butler, WI 53007-0423, (888)243-6914 or (414)214-0444; www.rbwagner.com, or comparable equivalent manufacturer's product subject to review by the Architect.
 - a. Anchor Plates: Provide steel anchor plates with holes for installation with expansion bolts. Size shall be as required to fit tight to pipe post. Anchor plates, where exposed, shall be factory shop prime painted, suitable for finish painting by others.
 - b. Base Plate Flanges: Provide manufacturer's standard "Extra Heavy Flat Base Flanges" of plain steel design with holes, furnished with threaded hole and set screw for securing base plate to pipe post. Size shall be as required to fit tight to pipe post. Base plate flanges shall be factory shop prime painted, suitable for finish painting by others.

2.10 MISCELLANEOUS

- A. Anchoring Cements: Products specified herein shall be as manufactured by CGM, Incorporated, 1445 Ford Road, Bensalem, PA 19020, (800)523-6570 or (215)638-4400; www.cgmbuildingproducts.com, or comparable equivalent products subject to review by the Architect.
 - 1. Exterior Use - Anchoring Cement: Super Por-Rok® Exterior Anchoring Cement, quality controlled hydraulic cement, quick-setting, pourable, non-metallic, non-shrink grout, in accordance with the following ASTM International Standard Specifications.
 - a. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
 - b. ASTM C900 - Standard Test Method for Pullout Strength of Hardened Concrete.
 - 2. Interior Use - Anchoring Cement: Por-Rok® Anchoring Cement, non-shrink, hydraulic, controlled expansion cement.
 - 3. Material Shelf Life: Do not retain material at the jobsite which has exceeded the shelf life recommended by the manufacturer.
- B. Isolation Coatings: Paint product specified herein shall be as manufactured by The Sherwin Williams® Company, Cleveland, OH, (800)321-8194 or (800)474-3794; www.sherwin-williams.com, or comparable manufacturer's equivalent products subject to review by the Architect.
 - 1. Aluminum Contact With Steel: Wherever aluminum items are to be secured to, or in contact with steel supporting members, paint the contact surface of the steel with the following self-priming paint product for both the surfaces of the steel supporting members and the aluminum.
 - a. Two (2) Coats: Macropoxy® 646 Fast Cure Epoxy, B58.

2. Aluminum Contact With Masonry or Concrete: Wherever aluminum items are to be secured to or in contact with masonry or concrete, shop paint the aluminum contact surface with the following self-priming paint product.
 - a. Two (2) Coats: Macropoxy® 646 Fast Cure Epoxy, B58.
3. Brass or Bronze Contact With Steel: Wherever brass or bronze items are to be in contact with steel members, paint the contact surfaces of the steel with the following.
 - a. Two (2) Coats: Macropoxy® 646 Fast Cure Epoxy, B58.
4. Steel Post Sleeves: Wherever brass and/or bronze posts for pipe railings are to be in contact with steel post sleeves and steel wedging, shop paint all surfaces of the steel products completely with isolation coating as specified herein for both interior and exterior surfaces of the steel products.
5. Condition of Painted Products: Paint coats shall be thoroughly dry prior to installation of the steel, aluminum, brass and/or bronze products. Exposed to view surfaces shall be clean and free of isolation coatings.

2.11 EXTERIOR AND INTERIOR STEEL STAIR CONSTRUCTION

- A. Design: Galvanized exterior and interior steel stair framing systems design shall be designed by a Professional Structural Engineer registered in the State of the proposed Project where the stairs are to be installed. Drawings for the design of the steel stair framing systems shall also be sealed by the same Engineer.
- B. Materials:
 1. Steel Plates, Shapes, and Bars: ASTM A36 - Standard Specification for Carbon Structural Steel.
 2. Steel Tubing: Cold-formed steel tubing complying with ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 3. Steel Bars for Gratings: ASTM A36 - Standard Specification for Carbon Structural Steel.
 4. Wire Rod for Grating Crossbars: ASTM A510 - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel.
 5. Galvanized Steel Sheet: ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; G90 coating, either Commercial quality or structural quality, Grade 33.
- C. Fasteners: Provide zinc-plated fasteners with coating complying with ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; Class Fe/Zn 25 for exterior use.
- D. Galvanizing: Provide zinc coating by the hot-dip process on iron and steel products. Galvanizing shall be in accordance with ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- E. Fabrication and Construction:
 1. Construct stairs to support a live load of 100 lbs. per square foot, (in addition to the dead load, uniformly distributed). Provide all hangers, beams, struts, landings, framing, stringer framing and other framing, as shown or required to support stairs.

2. Fabricate stringers of steel shapes as shown on Drawings. Provide steel angles welded to stringers to support treads and risers. Provide steel clips at top and bottom of each stringer for securing to adjacent construction. Provide landing framing as detailed.
 3. Stair construction shall be of steel grate type treads and landings. Fabricate treads, risers, and landings as shown on the Drawings. Cope ends and edges of all grating framing to fit closely to stringer and framing surface, and secure all parts in place by welding.
 4. Bar Grating as shown on the Drawings shall be such as manufactured by McNichols Co., 2502 North Rocky Point Drive, Suite 750, Tampa, FL 33607, (813)282-3828 or (800)237-3820; www.mcnichols.com, or comparable product, subject to review by the Architect.
 5. Anti-Slip Nosing:
 - a. Manufacturer: American Safety Tread Co., Inc., P.O. Box 611, Helena, AL 35080, (800)245-4881 or (205)664-0511; www.americansafetytread.com.
 - b. Abrasive Nosing: Stair treads and landing shall have Grating Nosing - Style 820, not less than 1-1/4" width, provided in lengths to fit grating sizes as indicated on the Drawings. Nosing shall meet and exceed safety surface specifications, including ADA, OSHA, and be in compliance with the Barrier-Free-Code for the physically impaired.
 6. Provide checker steel plate treads at Safety Lane Pit stair.
 7. Fabricate steel pipe railing assemblies from standard steel pipe as indicated and detailed on the Drawings, and specified herein.
 8. Erect stairs and landings in a rigid and secure manner, with treads and landings level, risers plumb, and with stringers parallel and in same slope.
- F. Prefabricated Stair Construction: Alternate preassembled stair construction may be permitted by such as manufactured by American Stair Corporation, 642 Forestwood Drive, Romeoville, IL 60446, (815)886-9600 or (800)872-7824; www.americanstair.com, or comparable manufacturer subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.

2.12 LINTELS

- A. Furnish to the Masonry Contractor for installing and setting, all loose steel lintels and plates, not shown on Structural Drawings, required for support of masonry above all openings over 3'-0" wide, including those required for items such as grilles, doors, ducts, wall recesses and other locations shown or required.
- B. Lintels shall be rolled structural shapes of sizes noted, selected for straightness and trueness of section. Camber shall not exceed 1/8" in 10'-0".
- C. Unless otherwise shown, lintels shall have a bearing of not less than 8" each side of opening.
- D. Galvanize all lintels in exterior walls.

2.13 STEEL LADDERS

- A. General: Interior roof access steel ladders shall be Occupational Safety and Health Administration (OSHA) approved ladders complete as detailed on Drawings. Fabricate steel ladders, as detailed with structural steel shapes indicated. Ladder rungs shall be steel bar rungs as specified herein and spaced as shown on Drawings. Drill side rails for rungs, set rungs into rails, weld rungs solidly into rails, and grind rails smooth. Provide all steel plate brackets, washers, and fasteners, including steel angle braces, as required and/or detailed to install ladders in place securely.
1. Slip-Resistant Metal Fabrications: Products specified herein shall be as manufactured by SlipNOT® Metal Safety Flooring, Division of W.S. Molnar Company, 2545 Beaufait Street, Detroit, MI 48207, (800)754-7668 or (313)923-0400; www.slipnot.com.
 - a. Steel Surface on Steel Substrates: SlipNOT® anti-slip, non-gritted steel surface on mill unfinished steel substrates shall be manufacturer's permanent all metal slip-resistant coating with "Grade 2, Medium" surface texture for 100% coverage on all exposed areas of the steel substrates.
 - 1) Anti-Slip Surface: Shop-applied coating for metal shall provide a Static Coefficient of Friction (Slip Resistance) of 0.6 or greater in accordance with Underwriters Laboratories UL 410 Standard.
 - 2) Note: All exposed steel component surfaces subject to contact by foot traffic shall have "SlipNOT® Anti-Slip Surface" coating as specified herein.
 - b. Ladder Rungs: Provide the following non-slip safety ladder rungs which meet and/or exceed Occupational Safety Healthy Administration (OSHA) Standards 1910.26 (a)(1)(v) and 1926.1053(a)(6)(i).
 - 1) Round Ladder Rungs: SlipNOT® Round Ladder Rung, 3/4" diameter solid cold-rolled steel bar.

2.14 HIGHWAY TYPE GUARD POSTS AND GUARDRAILS

- A. Manufacturers:
1. Gregory Highway Safety Products, Division of Gregory Industries, Inc., 4100 13th Street S.W., Canton, OH 44710, (330)477-4800; www.gregorycorp.com.
 2. Trinity Highway Products, LLC, 2525 N. Stemmons Freeway, Dallas, TX 75207, (800)527-6050 or (800)644-7976; www.highwayguardrails.com.
- B. Guardrails: Furnish and install guardrails of 12 gauge, minimum, standard hot dip galvanized steel complete with terminal ends and fasteners.
- C. Offset Blocks: 100% recycled polymers with UV protection, 5-1/8" wide x 14" high x 12" deep, Model MG14SH as manufactured by Mondo Polymer Technologies, P.O. Box 250, Reno, OH 45773, (740)376-9396, www.mondopolymer.com

2.15 TRENCH DRAIN GRATE

- A. Grate: Heavy duty galvanized steel bar grate as manufactured by Vulcraft Gating, www.vulcraft.com.
1. Bar Grates: 1-1/4" x 1/4" bearing bar, 15HW4, 59.1% open area.

PART 3 - EXECUTION3.01 SETTING AND ERECTING MISCELLANEOUS METAL

- A. Fabricate all items as required to be built into concrete or masonry completely, and deliver to site for installation by others. Furnish all parts complete with bolts, anchors, clips, ready to set. Deliver items to the general location of the Work. Where Work is composed of several parts, only those parts upon which anchors occur, will be set and built-in by the other Trades, ready to receive further field assembly by this Trade.
 - 1. All Work required to be anchored entirely in concrete shall be set by the Concrete Contractor.
 - 2. All Work required to be anchored entirely to masonry shall be set by the Masonry Contractor.
 - 3. All Work required to be anchored partially to masonry shall be set by the Masonry Contractor.
- B. Where necessary to secure Work to the structure by means of expansion bolts, cinch anchors, and similar connections, lay-out and install connections, install the Work and bolt up. Drill holes in Concrete and Masonry Work with rotary twist drills only.
- C. Furnish, connect, and completely install all other items. Erect all items to proper lines and levels, plumb and true, and in correct relation to adjoining Work. Secure all parts in a rigid and substantial manner using concealed connections whenever practicable.

3.02 HANDRAIL AND RAILING SYSTEMS

- A. Field Welding:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.
- B. Adjustment: Handrails and railing systems shall be adjusted prior to anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated but not less than that required by structural loads.
- C. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings to in-place construction.
- D. Nonwelded Connections: Use manufacturer's standard mechanical joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic filler cement colored to match finish of handrails and railing systems.
- E. Welded Connections: Use fully welded joints for permanently connecting railing components by welding. Cope or butt components to provide 100 percent contact or use manufacturer's standard fittings designed for this purpose.

3.03 STEEL LADDERS

- A. Steel Ladders: Interior steel ladders for access to roof hatches shall be Occupational Safety and Health Administration (OSHA) approved ladders, complete as shown on Drawings. Provide all steel plate brackets, washers, and fasteners, including steel angle braces, as required and detailed to install ladders in place securely.

3.04 FIRE PREVENTION

- A. Precautions: When welding or cutting with burning torches is required, take all precautions to prevent damage to the building(s) from fire, weld spatter, dripping molten metal, smoke and fumes, or other causes arising from the operations. Provide fireproof tarpaulins or enclosures around the areas of welding or burning.
- B. Trained Personnel and Equipment: Furnish a worker trained and experienced in fire-fighting, whose sole duty shall be to prevent damage and fire at each location where welding or burning is to be done. Furnish adequate and sufficient fire-fighting equipment and extinguishers at each location.

3.05 CLEAN-UP

- A. When steel has been installed, clean up spatter and debris resulting from welding.

3.06 TOUCH-UP PAINTING

- A. When factory/shop prime painted steel has been installed, touch-up welds, scarred and abraded members with rust-inhibiting priming paints as specified herein.

3.07 FIELD FINISH PAINTING

- A. Finish field painting of miscellaneous metal items as indicated on the Drawings and specified herein shall be by the Painting Contractor.

END OF SECTION

SECTION 06 10 00ROUGH CARPENTRY

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Furnish all labor, materials, equipment, and services necessary for Rough Carpentry Work indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Wood Studs, Joists, Nailers, Blocking, and Plywood - furnish and install.
 - 2. Rough Hardware - furnish and install.
 - 3. Driver Access Grab Bar.
- B. Related Sections: The following items of related Work will be performed under other sections of the Specifications, as indicated:
 - 1. Forms for Concrete - Sections 03 00 50 and 03 30 00.
 - 2. Miscellaneous Metal Work – Section 05 50 00.
 - 3. Sheet Metal Work - Section 07 60 00.
 - 4. Non-Structural Metal Stud Framing - Section 09 22 16.
 - 5. Gypsum Wallboard Construction - Section 09 29 00.
 - 6. Thin-Set Tile Work - Section 09 31 00.
 - 7. Painting and Finishing - Sections 09 91 13 and 09 91 23.
 - 8. Light Fixtures – Division 26.

1.02 QUALITY ASSURANCE

- A. Wood Treatment Plants: The treatment plant shall be franchised or licensed by the specified preservative and/or retardant manufacturers as specified herein.
- B. Requirements of Regulatory Agencies:
 - 1. Grades of Lumber and Plywood: Lumber and plywood shall be as defined by the rules of the recognized association of manufacturers producing the kind or species of lumber and plywood specified herein. All lumber and plywood shall be grade stamped by the inspecting authorities.

1.03 MEASUREMENTS

- A. Field Measurements: Contractor shall obtain field measurements of adjoining Work as required to locate and fit the Work of this section. Contractor shall be responsible for the accurate fitting of materials together and to the building(s).

1.04 SUBMITTALS

- A. General: Submit Shop Drawings and Product Data, to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Shop Drawings: Prepare complete Shop Drawings, showing dimensions, sections, details of materials, fabrication, and installation of materials and products.
- C. Product Data: Include the following for review.
 - 1. Wood Treatment Certificates for Lumber and Plywood.
 - 2. Materials and products specified herein under PART 2 – PRODUCTS Article heading “MISCELLANEOUS”.

1.05 PRODUCT DELIVERY, HANDLING AND STORAGE

- A. Protection: Protect all materials from the weather during transit and during storage at the site. Store materials above the ground, in sheds if possible. If outdoor storage is required, house materials under waterproof coverings. Do not deliver materials to the job site until required for installation. Take all precautions to avoid absorption of moisture by wood and plywood.

1.06 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner’s acceptance of the installation.

PART 2 - PRODUCTS

2.01 WOOD FOR ROUGH CARPENTRY

- A. Lumber: Wood shall conform to American Softwood Lumber Standard, current edition of “Voluntary Product Standard PS20”, as published by the National Institute for Standards and Technology (NIST). Grades shall conform with current grading rules of the Lumber Manufacturers Association, under whose rules the lumber is manufactured.
- B. Dimension and Board Lumber: Douglas Fir. All lumber shall be “seasoned dry” (S-DRY), 15% or less moisture content.
- C. Lumber Grades:
 - 1. Structural Joist and Planks: 2" to 4" thick, 6" and wider, Douglas Fir, S4S, No. 2 Grade or better.
 - 2. Light Framing and Studs: 2" to 4" thick, 2" to 4" wide, Douglas Fir, S4S, Construction Grade or better.

3. Boards: Douglas Fir, S4S, Standard Grade or better.
 4. Utility Shelving: Eastern White Pine, Idaho White, Ponderosa or Sugar Pine, Standard No. 3 Common Grade.
- D. Wood Treatments: All wood members shall be fire retardant treated as noted on the Drawings. Wood blocking and nailers at roof and/or in contact with masonry shall be preservative treated.

2.02 PLYWOOD

- A. Standards, Thicknesses and Grades: Plywood shall be in accordance with the National Institute of Standards and Technology (NIST) current U.S. Department of Commerce (DOC) Voluntary Product Standard PS 1-07, and the quality standards of the APA-The Engineered Wood Association (formerly American Plywood Association). Thicknesses shall be as indicated on the Drawings. Grades of plywood shall be as follows for various uses, as indicated by the registered grade-trademarks of APA:
1. A-C Plywood: A-C EXT-APA.
 2. A-D Plywood: A-D Exposure 1 (interior exposed, such as backboards for electrical and/or telephone panels).
 3. CDX Plywood: C-D Exposure 1 plywood with exterior glue (interior plywood backing).
 4. Plywood Sheathing: C-D EXT-APA or APA Standard with exterior glue.
- B. Engineered Wood Products: Products shall contain no urea formaldehyde.
- C. Fire Retardant Treatment: All plywood shall receive "Fire Retardant Treatment" as specified herein.

2.03 WOOD TREATMENTS

- A. Manufacturer: Wood treatments required and as specified herein shall be products by Arch Wood Protection, Inc., Arch Treatment Technologies, Inc., 5660 New Northside Drive, Suite 1100, Atlanta, GA 30328, (678)627-2000; www.archchemicals.com. Manufacturers with equivalent products and treatments shall be subject to review by the Architect.
- B. Wood Preservative Treatment: All wood members such as nailers and/or blocking at roof parapets, and/or in contact with masonry, and elsewhere as indicated on the Drawings, shall be pressure impregnated in accordance with the specifications for treatment by Arch Wood Protection, Inc., with Wolman® CCA (Chromated Copper Arsenate) wood preservative and shall bear the Wolmanized® trademark. Treated wood shall conform to AWPAC Standard P5 and have an identification mark certifying conformance. The treating process shall meet requirements of Federal Specification TT-W-571 and AWPAC Commodity Standards as applicable.
- C. Fire Retardant Treatment: Fire retardant treat all wood members, including lumber and plywood by pressure treating with Dricon® fire retardant chemicals, by Arch Wood Protection, Inc. Kiln dry all pieces after treatment. Identify all treated pieces with an Underwriters Laboratories, Inc., label or marking, prior to shipment to site. Treatment shall be in accordance with the impregnating salt manufacturer's U.L. approved, specifications, and shall render the wood fire retardant to the extent that the flame spread, and smoke development index does not exceed 25 per ASTM Standard E84 modified to require a 30 minute test period. The treating process shall conform to the requirements of the applicable AWPAC Standard C1, C2, C3, C4, C9, C14, C15, C16, C22, C23, C24, C28, C31, C33 and M4, for the species, product, preservative and end use. Preservatives shall conform to AWPAC P1/P13, P2, P5, P8 and P9. Include certification by treatment plant that the treatment will not bleed through finished surfaces.

- D. Exterior Fire Retardant Treatment: Fire retardant treat all wood members and plywood directly exposed to the weather with FRX® fire retardant chemical manufactured by Chemco Acquisition, Ferndale, WA (866)873-3789, www.frxwood.com
- E. Certification: Submit certificates of wood treatments. Stamp or brand lumber before delivery, indicating treatment applied.
- F. Exposed Wood/Field-Cuts: Surfaces of treated wood exposed by cutting or drilling at the job site shall be treated with heavy brush coat of same preservative or fire-retardant treatment used in treatment.

2.04 ROUGH HARDWARE

- A. General: Furnish all items of rough hardware such as spikes, nails, screws, bolts, anchors, brackets, etc., necessary for the installation of this Work.
- B. Bolts, Nuts, Expansion Shields: Use galvanized steel bolts for all bolting Work. Use carriage bolts and nuts, or welded stud bolts and nuts for securing wood members to steel framing. Use metallic expansion shields for securing bolts to concrete. Use similar shields or toggle bolts for securing to masonry. Select length of bolts to suit thickness of material being joined.
- C. Nails: Use nails conforming with Federal Specification FF-N-105B, except as otherwise specified. Use galvanized steel nails for all Work. Zinc coating on galvanized nails shall conform with Article 3.2.1 of the Federal Specification. Do not use aluminum nails.
- D. Corrosion Rates: Rough hardware in contact with fire retardant treated wood shall exhibit corrosion rates less than one mil per year when tested in accordance with Federal Specification MIL-L-19140E, Paragraph 4.6.5.2.
- E. Screws Fastening to Metal Framing: Screws to COMPLY with ASTM C1002 or ASTM C954, length as recommended by screw manufacturer for material being fastened.
- F. Power-Driven Fasteners: Fastener Systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- G. Adhesives for Gluing to Concrete or Masonry: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.

2.05 MISCELLANEOUS

- A. General: Miscellaneous materials specified herein represent products from the McMaster-Carr, P.O. Box 94930, Cleveland, OH 44101-4930, (330)995-5500; www.mcmaster.com, and illustrate the type, material, quality, required. Comparable products may be acceptable, subject to the Architect's review.
 - 1. Fastening Hardware: Provide materials such as screws, bolts, nuts, washers, nails, anchors, and miscellaneous other fastening products as required by the Drawings and/or field conditions.
- B. Building Paper: Waterproof paper conforming to ASTM Standard C171.
- C. Driver Access Grab Bar:
 - 1. Pipe and Fittings:
 - a. 1-1/2" O.D. treated galvanized steel pipe.
 - b. 90° treaded galvanized steel elbow.
 - c. Treaded galvanized steel floor flange with holes for connection to wall construction.

- D. Isolation Coatings: Paint product specified herein shall be as manufactured by The Sherwin Williams® Company, Cleveland, OH, (800)321-8194 or (800)474-3794; www.sherwin-williams.com, or comparable manufacturer's products subject to review by the Architect.
1. Paint Product: Two (2) coats of Macropoxy® 646-100 Fast Cure Epoxy, B58.
 2. Condition of Painted Products: Paint coats shall be thoroughly dry prior to installation of the steel/metal products. Exposed to view surfaces shall be clean and free of isolation coatings.

PART 3 - EXECUTION

3.01 ROUGH CARPENTRY

- A. Nailers, and Blocking:
1. Neatly and accurately fit together with all necessary bolts and spikes, all lumber where indicated on Drawings, such as blocking, nailers, as required to make secure.
 2. Where wood blocking is required in metal stud framed walls, e.g., for support of Tenant's or Owner's fixturing, securely fasten the wood blocking to the metal stud framing at positions required, as detailed and/or noted on the Drawings. Coordinate Work with Tenant's and/or Owner's Representative.
 3. Miscellaneous wood items which are required to be built into concrete or masonry shall be delivered to the respective contractors for installation.
 4. Metal Roof Deck Flutes: Provide wood blocking in deck voids where and as indicated on the Drawings.
- B. Rough Hardware: Install all items of rough hardware as necessary for the execution of the Work.
- C. Preservative Treated Wood: Install wood treated with approved preservative for wood nailers at roof parapets, and where in contact with masonry. Surfaces of treated wood exposed by cutting or drilling at the job site shall be treated with heavy brush coat of same preservative as applied at the treatment plant.
- D. Fire Retardant Treated Wood: Install wood that has been fire retardant treated, and wood blocking as required by Drawings and/or field conditions.
- E. Plywood: Install plywood of thickness noted and where indicated on Drawings. All Work and nailing shall be in accordance with the recommendations of APA-The Engineered Wood Association, and with the governing code requirements.

3.02 CLEAN-UP

- A. Work Required: Clean-up or repair adjacent finish Work which is soiled, marred, or damaged by the Work of this section, at Contractor's expense.
- B. Debris and Waste Materials: During progress of the Work, the premises shall be kept free of all debris and waste materials resulting from the Work of this section. During progress of the Work, upon completion of Work, and before final acceptance of the Work, remove all construction debris and rubbish from the site and dispose of legally. Upon completion and before final acceptance of the Work, all debris, rubbish, unused materials, tools, and equipment shall be removed from the site.

END OF SECTION

SECTION 06 20 00FINISH CARPENTRY

The requirements of the "General Conditions", the "Supplementary Conditions", and "Division 1" sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Furnish all labor, materials, equipment, and services necessary for Finish Carpentry Work indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Plastic Laminated Sills.
 - 2. Plastic Laminated Mail Slots.
 - 3. Counter Support Brackets.
- B. Color Selections: Refer to the Drawings.
- C. Related Sections: The following items of related Work will be performed under other sections of the Specifications:
 - 1. Masonry Work - Section 04 20 00.
 - 2. Rough Carpentry - Section 06 10 00.
 - 3. Joint Protection - Section 07 90 00.
 - 4. Non-Structural Metal Stud Framing - Section 09 22 16.
 - 5. Gypsum Wallboard Construction - Section 09 29 00.
 - 6. Thin-Set Tile Work - Section 09 31 00.
 - 7. Painting and Finishing - Sections 09 91 23.

1.02 QUALITY ASSURANCE

- A. Wood Treatment Plants: The treatment plant shall be franchised or licensed by the specified preservative and/or retardant manufacturers as specified herein.
- B. Requirements of Regulatory Agencies:
 - 1. Grades of Lumber and Plywood: Lumber and plywood shall be as defined by the rules of the recognized association of manufacturers producing the kind or species of lumber and plywood specified herein. All lumber and plywood shall be grade stamped by the inspecting authorities.
- C. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-Accredited Certification Body.

1.03 MEASUREMENTS

- A. Field Measurements: Contractor shall obtain field measurements of adjoining Work as required to locate and fit the Work of this section. Contractor shall be responsible for the accurate fitting of materials together and to the building(s).

1.04 SUBMITTALS

- A. General: Submit Shop Drawings, Product Data, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Shop Drawings: Prepare complete Shop Drawings, showing dimensions, sections, details of materials, fabrication, and installation of materials and products. Special attention shall be given to, but not necessarily limited to the following:
1. Fabricated Plastic Laminate Assemblies.
 2. Miscellaneous Millwork, Casework.
- C. Product Data: Include the following for review.
1. Wood Treatment Certificates for Lumber and Plywood.
 2. Plastic Laminate and Adhesive.
 3. Products specified herein under Article heading "MISCELLANEOUS".
- D. MDF: ANSI A208.2 - American National Standard for Medium Density Fiberboard, made with binder containing no urea-formaldehyde resin.
- E. Particleboard: ANSI A208.1 - American National Standard for Particleboard, Grade M-2 made with binder containing no urea-formaldehyde resin.

1.05 PRODUCT DELIVERY, HANDLING AND STORAGE

- A. Protection: Protect all materials from the weather during transit and during storage at the site. Store materials above the ground, in sheds if possible. If outdoor storage is required, house materials under waterproof coverings. Do not deliver materials to the job site until required for installation. Take all precautions to avoid absorption of moisture by wood and plywood.

1.06 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance of the installation.

PART 2 - PRODUCTS

2.01 WOOD FOR FINISH CARPENTRY

- A. Lumber Grades: All lumber shall conform to, and be graded in accordance with American Lumber Standard PS-20.

1. Grading Authority Stamp: All lumber shall bear stamp of grading authority indicating compliance with specified species, grade and moisture content. Finish lumber shall be stamped on back or end where not exposed to view.
2. Dimension and Board Lumber: Douglas Fir or Pine. Maximum allowable moisture content shall be 12%.
 - a. Appearance Framing: 2" to 4" thick, 2" and wider shall be Douglas Fir, S4S, No. 1/Appearance.
 - b. Boards: 1" thick, 2" and wider shall be Douglas Fir or Pine, S4S, Superior or better.
- B. Millwork and Trim: "Custom Grade" as defined in the Architectural Woodwork Quality Standards Guide Specifications, and Quality Certification Standards of the Architectural Woodwork Institute (AWI).
- C. Wood Specie: Unless otherwise noted on the Drawings, wood specie shall be as follows:
 1. Paint Grade Trim: Natural Birch or Poplar.
 2. Stain Grade Trim: White Oak.

2.02 PLYWOOD

- A. Standards, Thicknesses and Grades: Plywood shall be in accordance with the National Institute of Standards and Technology (NIST) current DOC VPS Standard PS 1-07, and the quality standards of the APA-The Engineered Wood Association (formerly American Plywood Association). Thicknesses shall be as indicated on the Drawings. Grades of plywood shall be as follows for various uses, as indicated by the registered grade-trademarks of APA:
 1. A-B Plywood: Group I APA A-B Interior.
- B. Engineered Wood Products: Products shall contain no urea formaldehyde.
- C. Fire Retardant Treatment: All plywood shall receive Wood Treatments" as specified herein.

2.03 WOOD TREATMENTS

- A. Manufacturer: Wood treatments required and as specified herein shall be products by Arch Wood Protection, Inc., Arch Treatment Technologies, Inc., 5660 New Northside Drive, Suite 1100, Atlanta, GA 30328, (678)627-2000; www.archchemicals.com. Manufacturers with equivalent products and treatments shall be subject to review by the Architect.
- B. Fire Retardant Treatment: Fire retardant treat all wood framing, lumber and plywood by pressure treating with Dricon® fire retardant chemicals, by Arch Wood Protection, Inc. Kiln dry all pieces after treatment. Identify all treated pieces with an Underwriters Laboratories, Inc., label or marking, prior to shipment to site. Treatment shall be in accordance with the impregnating salt manufacturer's U.L. approved, specifications, and shall render the wood fire retardant to the extent that the flame spread, and smoke development index does not exceed 25 when tested in an extended 30 minute tunnel test in accordance with ASTM E84, NFPA 255 or UL 723. The treating process shall conform to the requirements of the applicable AWP Standard C1, C2, C3, C4, C9, C14, C15, C16, C22, C23, C24, C28, C31, C33 and M4, for the species, product, preservative and end use. Preservatives shall conform to AWP P1/P13, P2, P5, P8 and P9. Include certification by treatment plant that the treatment will not bleed through finished surfaces.

1. Corrosion Properties: Fire retardant treated wood in contact with carbon steel, galvanized steel, aluminum, copper and red brass shall exhibit corrosion rates less than 1 mil (0.025 mm) per year when tested in accordance with Fed. Spec. MIL-L19140, Paragraph 4.6.5.2.
 2. Testing: Testing on fire performance, strength and corrosion properties of fire retardant treated wood shall be recognized by issuance of a National Evaluation Services Report.
- C. Certification: Submit certificates of wood treatments. Stamp or brand lumber before delivery, indicating treatment applied.
- D. Exposed Wood/Field-Cuts: Surfaces of treated wood exposed by cutting or drilling at the job site shall be treated with heavy brush coat of same preservative or fire-retardant treatment used in treatment.

2.04 ROUGH HARDWARE

- A. General: Furnish all items of rough hardware such as spikes, nails, screws, bolts, anchors, brackets, etc., necessary for the installation of this Work.
- B. Bolts, Nuts, Expansion Shields: Use galvanized steel bolts for all bolting Work. Use carriage bolts and nuts, or welded stud bolts and nuts for securing wood members to steel framing. Use metallic expansion shields for securing bolts to concrete. Use similar shields or toggle bolts for securing to masonry. Select length of bolts to suit thickness of material being joined.
- C. Nails: Use nails conforming with Federal Specification FF-N-105B, except as otherwise specified. Use galvanized steel nails for all Work. Zinc coating on galvanized nails shall conform with Article 3.2.1 of the Federal Specification. Do not use aluminum nails. Except as otherwise specified, use common nails for securing of rough carpentry, use casing or finish nails, counter-set, for securing of finish carpentry.
- D. Corrosion Rates: Rough hardware in contact with fire retardant treated wood shall exhibit corrosion rates less than one mil per year when tested in accordance with Federal Specification MIL-L-19140E, Paragraph 4.6.5.2.

2.05 PLASTIC LAMINATE

- A. General: Materials specified herein represent products of quality required.
- B. Plastic Laminate:
1. Brand Name Products and Manufacturers:
 - a. Formica® by Formica Corporation, 10155 Reading Road, Cincinnati, OH 45241, (513)786-3400 or (800)367-6422; www.formica.com.
 - b. Nevamar® by Nevamar™ Decorative Surfaces, One Nevamar Place, Hampton, SC 29924, (803)943-7200 or (800)638-4380; www.nevamar.com.
 - c. Pionite® by Pionite® Decorative Surfaces, A Subsidiary of Panolam Industries, Inc., One Pionite Road, Auburn, ME 04211-1014, (207)784-9111 or (800)746-6483; www.pionite.com.
 - d. Wilsonart® by Wilsonart LLC, 2400 Wilson Place, P.O. Box 6110, Temple, TX 76503-6110, (254)207-7000 or (800)433-3222; www.wilsonart.com.

2. Plastic Laminate Sheets: Surfaces shown on the Drawings as plastic laminate covered shall be finished with nominal 1/16" thick high pressure plastic laminate sheets as specified herein.
 - a. Standards and Grade: Plastic laminate sheets shall conform to NEMA Standards, General Purpose Grade 10, meeting or exceeding performance standards of NEMA Standards Publication, NEMA LD-3 - High Pressure Decorative Laminates.
3. Balanced Back Construction: Wherever possible shop apply plastic laminate under pressure to approved back-up specified herein.
 - a. All panels (except as otherwise indicated) shall have "balanced back" construction, using manufacturer approved backing sheet.
 - b. Provide self-edging surfaces.
4. Adhesive: Provide contact adhesive such as Formica® (Partner with Choice Brand Adhesives) F160 Premium Water-based Brush, Roll, and Spray Grade Contact Cement, or comparable equivalent product as recommended by the plastic laminate manufacturers specified herein, subject to review by the Architect.
5. Quality Assurance: All plastic laminate Work shall be performed by experienced plastic laminate skilled workers.
6. Protection: Deliver the Work to the job site wrapped and protected from abrasion and moisture.
7. Colors, Patterns, and Finishes: As selected by the Architect and/or Owner from submitted plastic laminate manufacturers' standards product charts.

2.06 COUNTER SUPPORT BRACKET

- A. Manufacturer: Rangine Corp., Needham, MA 02494, (781)455-8700 or (800)826-6006, www.rakks.com.
- B. Bracket: Inside wall mount 2" x 2" x 0.25" T-extrusion, Model No. EH-1818FM.

2.07 MISCELLANEOUS

- A. General: Miscellaneous materials specified herein represent products from the McMaster-Carr, P.O. Box 94930, Cleveland, OH 44101-4930, (330)995-5500; www.mcmaster.com, and illustrate the type, material, quality, required. Comparable products may be acceptable, subject to the Architect's review.
 1. Fastening Hardware: Provide materials such as screws, bolts, nuts, washers, nails, anchors, and miscellaneous other fastening products as required by the Drawings and/or field conditions.

PART 3 - EXECUTION

3.01 FINISH CARPENTRY WORK

- A. General:
 1. All Finish Carpentry Work shall be executed by skilled mechanics in a workmanlike manner. All joints shall be neatly and accurately made, closely fitted and assembled to remain tight and conceal any shrinkage.

2. All wood shall be well sanded to perfectly smooth surfaces, touched-up by hand and made suitable to receive paint or stain finish Work by Painting Contractor.
 3. Protect all finish materials from damage due to traffic or other construction Work, by covering with building paper and boards. Protection shall be particularly required for the jambs of openings through which material is being transported.
- B. Plastic Laminate: Fabricate, fit, and install plastic laminate finished window sills where shown and as detailed on the Drawings, all in accordance with manufacturer's recommendations and the best practices of the trade.

3.02 CLEAN-UP

- A. Work Required: Clean-up or repair adjacent finish Work which is soiled, marred, or damaged by the Work of this section, at Contractor's expense.
- B. Debris and Waste Materials: During progress of the Work, the premises shall be kept free of all debris and waste materials resulting from the Work of this section. During progress of the Work, upon completion of Work, and before final acceptance of the Work, remove all construction debris and rubbish from the site and dispose of legally. Upon completion and before final acceptance of the Work, all debris, rubbish, unused materials, tools, and equipment shall be removed from the site.

END OF SECTION

SECTION 06 41 16PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

The requirements of the "General Conditions", the "Supplementary Conditions", and "Division 1" sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Furnish all labor, materials, equipment, and services necessary for Rough Carpentry Work indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Plastic-laminate-faced architectural cabinets.
 - 2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets that are not concealed within other construction.
- B. Related Sections: The following items of related Work will be performed under other sections of the Specifications, as indicated:
 - 1. Rough Carpentry - Section 06 10 00.
 - 2. Non-Structural Metal Stud Framing - Section 09 22 16.
 - 3. Gypsum Wallboard Construction - Section 09 29 00.
 - 4. Thin-Set Tile Work - Section 09 31 00.
 - 5. Painting and Finishing - Sections 09 91 23.
 - 6. Plastic-Laminate-Clad Countertops - Section 12 36 23.13.
 - 7. Plumbing Fixtures - Division 22.
 - 8. Light Fixtures - Division 26.

1.02 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.03 SUBMITTALS

- A. General: Submit Shop Drawings and Product Data, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Shop Drawings: Prepare complete Shop Drawings, showing dimensions, plans, elevations, sections, attachment details, details of materials, fabrication, and installation of materials and products.
 - 1. Apply AWI Quality Certification program label to Shop Drawings.

- C. Samples: For each exposed product and for each color and texture specified, in manufacturer's or fabricator's standard size.
 - 2. Plastic Laminates: 8 by 10 inches for each type, color, pattern, and surface finish required.
 - a. Provide one sample applied to core material with specified edge material applied to one edge.
 - 3. Corner Pieces:
 - a. Cabinet-front frame joints between stiles and rails and at exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
 - b. Miter joints for standing trim.
 - 4. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish.

1.04 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Manufacturer Qualifications: Laminate manufacturer producing products in an ISO 9001 certified facility.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.06 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.01 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of cabinets indicated for construction, finishes, installation, and other requirements.

- B. Custom Design: 1" Reveal.
- C. Type of Construction: Frameless.
- D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Wilsonart LLC; Decorative Plastic Laminates or a comparable product by one of the following:
 - a. Abet Laminati Inc.
 - b. Formica Corporation.
 - c. Lamin-Art, Inc.
 - d. Pionite; a Panolam Industries International, Inc. brand.
- E. Laminate Cladding for Exposed Surfaces:
 - 1. Horizontal Surfaces: Grade HGS.
 - 2. Postformed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade HGS.
 - 4. Edges: ABS/PVC extruded fabrication.
 - 5. Pattern Direction: Vertically for doors and fixed panels, horizontally for drawer fronts.
- F. Materials for Semi Exposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.
 - a. Edges of Plastic-Laminate Shelves: ABS/PVC extruded fabrication.
 - b. For semi exposed backs of panels with exposed plastic-laminate surfaces, provide surface of NEMA LD 3, Grade VGS high-pressure decorative laminate.
 - 2. Drawer Sides and Backs: Solid-hardwood lumber.
 - 3. Drawer Bottoms: Hardwood plywood Thermoset decorative panels.
- G. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: NEMA LD 3, Grade VGL thermoset decorative panels.
- H. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 - 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners.
- I. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As selected by Architect from laminate manufacturer's full range.
 - a. Patterns, matte finish.

2.02 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
 1. Wood Moisture Content: 5 to 10 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
- C. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.
 1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
 2. Particleboard: ANSI A208.1, Grade M-2.
 3. Softwood Plywood: DOC PS 1, medium-density overlay.

2.03 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
 1. Use treated materials that comply with requirements of referenced quality standard. Do not use materials that are warped, discolored, or otherwise defective.
 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.
- B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 1. Kiln-dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
 2. Mill lumber before treatment and implement procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of architectural cabinets.

- C. Fire-Retardant Particleboard: Made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.
1. For panels 3/4 inch thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 and 225 lbf, respectively.
 2. For panels 13/16 to 1-1/4 inches thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi; modulus of elasticity, 250,000 psi; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf, respectively.
 3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Flakeboard Company Limited.
 - b. SierraPine.
- D. Fire-Retardant Fiberboard: MDF panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Panel Source International, Inc.
 - b. SierraPine.

2.04 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets as follows:
1. Hinges: Stanley Pivots No. 331 or 332 (US10).
 2. Drawer and Door Pulls: Stanley No. 4883, 1/2 (US10) with No. 4487 base (US10).
 3. Catches: Stanley No. SP46.
 4. Adjustable Shelf Hardware: Knappe and Vogt No. 255 standards and No. 256 supports.
 5. Drawer Slides: Knappe and Vogt No. 1294.
 6. File Drawer Slides: Knappe and Vogt No. 8500.
 7. Pencil Drawer Slides: Knappe and Vogt No. 8200.
 8. Key Board Drawer: Knappe and Vogt No. 8150.
 9. Receptionist Gate: Hager No. 1253 (half surface spring hinges).

2.05 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.06 FABRICATION

- A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs. For decorative plastic laminates, comply with manufacturer's written fabrication instructions.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.02 INSTALLATION

- A. Grade: Install cabinets to comply with quality standard grade of item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.
- C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.
- D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.
 - 1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
 - 2. Install cabinets without distortion so doors and drawers' fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

3.03 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semiexposed surfaces. Clean decorative plastic laminate surfaces according to manufacturer's written care and maintenance instructions.
- D. Protect completed work from damage for duration of construction period.

END OF SECTIO

SECTION 07 13 00SHEET WATERPROOFING

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Furnish all labor, materials, equipment, and services necessary for Sheet Waterproofing Work indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Sheet Membrane Waterproofing System.
- B. Related Sections: The following items of related Work will be provided under other sections of the Specifications:
 - 1. Concrete Foundation Work - Section 03 00 50.
 - 2. Cast-In-Place Concrete - Section 03 30 00.
 - 3. Joint Protection - Section 07 90 00.
 - 4. Foundation Excavation, Backfilling, and Drainage - Section 31 23 16.

1.02 INSPECTION

- A. Prior to the start of Work, inspect all surfaces to receive waterproofing and flashing, and report to the General Contractor in writing, any unacceptable surfaces.
- B. Installation of materials shall be considered Waterproofing Contractor's acceptance of the surface to be covered. Waterproofing and flashing which becomes damaged or defective because of defects in the substrate shall be promptly repaired or replaced by Waterproofing Contractor, at no cost to the Owner.

1.03 QUALITY ASSURANCE

- A. General: All materials, articles, accessories incorporated in the Work shall be type and quality specified herein, and subject to the Architect's review. Methods of preparation, construction and installation of such materials, articles and accessories shall be strictly in accordance with the accepted standard practices, manufacturer's printed specifications and/or instructions, the Architect's Drawings and Specifications, and as directed by the Architect.
- B. Environmental Requirements: All components of the waterproofing systems shall comply with all applicable Federal and State Regulations on Volatile Organic Compounds (VOC).
- C. Manufacturer Qualifications: Manufacturer of the waterproofing materials shall have been regularly engaged in the production of waterproofing materials for a minimum of ten (10) years, and shall have three (3) similar installations with a minimum of five (5) years service at each installation.

- D. Field Quality Control: A full-time employee of the manufacturer who is trained in the application of the specified waterproofing shall be available for consultation and periodic jobsite inspections before, during, and after the required application of the waterproofing system.

1.04 SUBMITTALS

- A. General: Submit Product Data to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

1.05 PRODUCT DELIVERY, HANDLING AND STORAGE

- A. Delivery: Deliver all materials to the job site in original sealed containers clearly marked with the manufacturer's identification on each package. Opened or damaged packages will not be acceptable, and shall be removed from the site.
- B. Handling: Contractor shall obtain Material Safety Data Sheets (MSDS) from the manufacturer and acquaint himself with the available information on safe handling, storage, personal protection, health and environmental considerations on the products specified herein. Contractor shall carefully read the detailed precaution statements on product labels and the MSDS before use.
- C. Storage: Do not store materials for long periods in direct sunlight. Store all materials off the ground, and in sheltered storage areas designated by the General Contractor. Handle products to avoid damage to containers.
 - 1. Protection Boards: Store protection boards on pallets and placed on a level surface.
- D. Material Shelf Life: Do not retain material at the jobsite which has exceeded the shelf life recommended by the manufacturer.

1.06 PRE-WATERPROOFING APPLICATION CONFERENCE

- A. Job-Site Meeting: Before starting Work, arrange a job-site meeting with representatives of the Owner, the Owner's Consultant, Concrete and Masonry Contractors, and the Architect to discuss procedures, Specifications, and application, job and surface readiness, material storage and protection, and any questions pertaining to the waterproofing system.

1.07 PROJECT CONDITIONS

- A. Substrate: All surfaces shall be properly prepared to receive waterproofing in accordance with manufacturer's recommendations. All concrete shall be properly cured and dried.
- B. Environmental Conditions:
 - 1. Weather and Temperature: Apply the specified waterproofing systems in dry weather conditions when air and surface temperatures are 40°F. (5°C.) or above.
 - 2. Detrimental Conditions: Discontinue all Work during rain.
- C. Compatibility: All adjoining materials must be compatible with the specified waterproofing system.
- D. Protection:
 - 1. Vertical Waterproofing: Unless otherwise indicated on the Drawings, protect all vertical waterproofing with the specified protection board.
 - 2. Horizontal Waterproofing: Protect all horizontal waterproofing with 1/8" asphaltic hardboard.

- a. If steel reinforcing bars are placed over the waterproofing, install one (1) layer of 1/4" thick or two (2) layers of 1/8" thick asphaltic hardboard.

1.08 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense, any imperfections which may develop during the warranty period specified and damage to other Work caused by imperfections, or by repairing imperfections. The warranty period shall be not less than two (2) years from date of Owner's acceptance of the installation.

PART 2 - PRODUCTS

2.01 SHEET MEMBRANE WATERPROOFING SYSTEM

- A. Manufacturer: W.R. Grace & Co. - Conn, 62 Whittemore Avenue, Cambridge, MA 02140, (877)423-6491 or (866)333-3726; www.na.graceconstruction.com.
- B. System: Grace Construction Products, Below Grade Waterproofing, Bituthene® System 4000.
- C. Components: Waterproofing system shall include, but not necessarily be limited to the following products.
 - 1. Waterproofing Membrane: Self-adhesive, cold-applied, 1.5 mm (1/16") thick flexible, pre-formed waterproof membrane which combines a high performance, cross laminated, HDPE (high density polyethylene) carrier film with a super tacky, self-adhesive rubberized asphalt compound.
 - 2. Surface Conditioner: System 4000 Surface Conditioner, water-based, latex surface treatment formulated to prepare concrete surfaces for the specified waterproofing membrane.
 - 3. Bituthene Mastic: Rubberized asphalt-based mastic.
 - 4. Liquid Membrane: Two-component, electrometric, cold-applied trowel grade material.
 - 5. Protection Board: Lightweight, expanded polystyrene board, not less than 1" thick, with a nominal density of 1.0 lb./cu. ft.
- D. Physical Properties: All materials shall meet the physical properties specified for W.R. Grace & Co. - Conn, Bituthene® 4000 Waterproofing System.

PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION OF SUBSTRATE

- A. Masonry Walls: Mortar parging of masonry walls will be by Masonry Contractor.
- B. Concrete Substrates: All concrete shall be properly cured and dried not less than seven (7) days for normal structural concrete and fourteen (14) days for lightweight structural concrete. Do not apply the waterproofing system over insulating concrete.

- C. Surface Conditions and Preparation: All surfaces to receive waterproofing shall be structurally sound and free of voids, spalled areas, loose aggregate, sharp protrusions, coarse aggregate, grease, oil, wax, dust, dirt, and debris. Surfaces shall be clean and dry. Point holes, joints, and cracks flush with mortar, and cut off or grind smooth high spots. Remove dust and foreign matter.
- D. Protection: All adjacent finished surfaces shall be protected by furnishing and installing protective coverings. At completion of Work, remove all protective coverings, and if unsalvageable, transport to central area designated by the General Contractor.

3.02 INSTALLATION

- A. General: Prepare and apply waterproofing materials in accordance with the manufacturer's written installation instructions and specifications, and as specified herein.
 - 1. Membrane Waterproofing: Install membrane waterproofing system on exterior side of concrete foundation walls as indicated on Drawings.
 - 2. Protection Board: Install protection board at the exterior walls and elevator pit walls as indicated on the Drawings and/or directed by the Architect.
 - 3. Surface Conditioner Application:
 - a. Dilute concentrated Surface Conditioner prior to use.
 - b. Apply diluted surface conditioner by fine mist.
 - c. Allow surface conditioner to dry completely prior to waterproofing membrane application. The surface conditioner is considered dry when the substrate returns to its original color. Allow a minimum of thirty (30) minutes drying time.
 - d. If conditioned areas are not covered that day, recondition only if significant dust or dirt accumulates.
- B. Foundation Walls and Vertical Surfaces:
 - 1. Membrane Installation: Apply waterproofing membrane vertically in lengths for seven feet or less. On higher walls apply two or more lengths of membrane with the upper length overlapping the lower length by not less than 2-1/2". Roll entire membrane completely and firmly with a handroller as soon as possible.
 - 2. Sealing Edges: Seal all vertical and horizontal terminations with Bituthene Mastic or Liquid Membrane.
 - 3. Formation of Seams: All edges and end laps shall be overlapped not less than 2-1/2". Patch misaligned seams or inadequately lapped seams with waterproofing membrane. Seal the edges of all patches with a troweling of Bituthene Mastic or Liquid Membrane.
 - 4. Formation of Corners:
 - a. Prepare inside corners by installing a 3/4" fillet of liquid membrane. Extend liquid membrane 6" in each direction from the corner.
 - b. Outside corners must be free of sharp edges. Prepare outside corners by installing a 12" wide strip of waterproofing membrane centered on the corner.
 - c. Install waterproofing membrane over treated inside and outside corners.

5. Details: Consult the manufacturer's Waterproofing Products Manual for complete Detail Work.
6. Protection Boards: Protection boards shall be installed in accordance with the manufacturer's recommendations.
- C. Horizontal Surfaces: As indicated on the Drawings or required by field conditions, waterproofing membrane shall be installed in accordance with the manufacturer's recommendations, subject to review by the Architect.
- D. Limitations:
 1. The specified waterproofing membrane is not designed to be permanently exposed to sunlight.
 2. Use of thin set mortar is not recommended.
 3. Do not apply waterproofing system when ambient or surface temperatures are below 40°F.
- E. Protection Boards: Apply as soon as possible, preferably as the membrane is completed.
- F. Backfilling: Foundation Excavation and Backfilling Contractor shall start backfilling no sooner than recommended by the waterproofing system manufacturer, and shall allow for execution of the waterproofing test. Backfilling shall not commence until waterproofing test has been completed and approved by the Owner's Supervising Engineer. Backfilling shall be completed within seven (7) days of the protection board installation and sooner for applications of waterproofing membrane without protection board as recommended by the waterproofing system manufacturer.

3.03 DAMAGED WORK

- A. All damaged or defective Work shall be replaced by new. All other Work which becomes damaged during the replacement of damaged or defective Work shall be corrected by Waterproofing Contractor to the satisfaction of the Architect, at no cost to the Owner.

3.04 WATER TESTING

- A. Water testing shall be made prior to placement of any protection boards.
- B. At completion of the Waterproofing Work, test the watertightness of the installation in the presence of the Owner's Supervising Engineer in accordance with the manufacturer's recommendations.

3.05 CLEAN-UP

- A. Work Required: Clean-up any Work soiled in the performance of the Work under this section.
- B. Debris and Waste Materials: During progress of the Work, upon completion of Work, and before final acceptance of the Work, keep the premises free of debris and waste materials resulting from Work of this section. Remove all debris and rubbish to central area designated by the General Contractor, for general clean-up by the General Contractor, or if directed by the General Contractor to remove from the site and legally dispose.
- C. Unused Materials, Tools, and Equipment: Upon completion of Work and before final acceptance of the Work, remove all unused materials, tools, and equipment from the site.

END OF SECTION

SECTION 07 21 00THERMAL INSULATION

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, and services necessary for Insulation Work indicated on the Drawings and/or required by field conditions, and as specified herein. Work includes, but is not necessarily limited to the following:
1. Blanket/Batt Insulation.
 2. Metal Building Insulation.
- B. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:
1. Concrete Work - Division 03.
 2. Rough Carpentry - Section 06 10 00.
 3. Sheet Metal Work - Section 07 60 00.
 4. Joint Protection - Section 07 90 00.
 5. Non-Structural Metal Stud Framing - Section 09 22 16.
 6. Gypsum Wallboard Construction - Section 09 29 00.
 7. Metal Building System - Section 13 34 19.

1.02 REFERENCES

- A. Materials shall meet the property requirements of one or more of the following specifications as applicable to the specific product or end use:
1. ASTM C991 - Standard Specification for Flexible Fibrous Glass Insulation for Metal Buildings.
 2. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
 3. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 4. ASTM E 96 - Standard Test Method for Water Vapor Transmission of Materials in Sheet Form (Procedure A).
 5. NAIMA 202-96(R) (Rev. 2000) STANDARD For Flexible Fiberglass Insulation to be Laminated for Use in Metal Buildings.

6. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
7. UL 723 - Test for Surface Burning Characteristics of Building Materials.

1.03 SUBMITTALS

- A. General: Submit manufacturer's literature to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Product Data: Submit three (3) sets of manufacturer's Product Data for each type of insulation and vapor retarder tape specified herein.

1.04 MATERIAL DELIVERY AND STORAGE

- A. Delivery: Deliver only acceptable materials to the site in original boxes and wrappings, clearly labeled with all pertinent information to facilitate checking.
- B. Storage: Store materials at the site off the ground and in properly protected dry storage facilities, until ready for use. Provide a tarpaulin covering over the materials, securely tied down. Wet, damp, or damaged materials shall not be used.

1.05 SCAFFOLDING

- A. Furnish, erect, and maintain all scaffolding and ladders in accordance with applicable code requirements. Erect at times and locations so as not to delay any part of the Work, and promptly remove when no longer required.

1.06 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form warranting all materials and workmanship to remain in serviceable and satisfactory condition and make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

PART 2 - PRODUCTS

2.01 BLANKET/BATT INSULATION

- A. Manufacturer: Insulation specified herein shall be as manufactured by Thermafiber, Inc., 3711 Mill Street, Wabash, IN 46992, (888)834-2371 or (260)563-2111; www.thermafiber.com.
 1. Insulation: Commercial quality, inorganic and noncombustible Thermafiber® Fire Safety Blankets, open-faced with vapor barrier (foil-faced vapor retarder), unless otherwise noted on the Drawings, flame-resistant, mineral wool fiber insulation in compliance with ASTM Standard C665.
- B. Comparable Products: Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.
- C. Blanket/Batt Widths: Provide as required by framing member spacings indicated on Drawings, and/or spacings found by field conditions.

- D. Surface Burning Characteristics: Class A fire hazard classification in accordance with ASTM Standard E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 1. With Vapor Barrier: Thermafiber® FS-25 (with foil-faced vapor retarder attached), Type III, Flame Spread maximum 25, and Smoke Developed 0.
 - 2. Without Vapor Barrier: Thermafiber® FS-15 (unfaced), Type I, Flame Spread 0, and Smoke Developed 0.
- E. Vapor Retarder Facing: Foil-scrim (FSP) laminate vapor retarder shall be applied with a flame-resistant adhesive. Class A flame-spread rating. Vapor retarder facing, shall have 0.02 perm rating, or better, when tested in accordance with ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials, Procedure A.
- F. Type and Quality: Rated non-combustible as defined by National Fire Protection Association NFPA Standard 220, when tested in accordance with ASTM E136-Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C. Insulation shall be nonasbestos, mold resistant, moisture-resistant, noncorrosive, nondeteriorating, mildew-proof and vermin-proof.
- G. Thermal Resistance Values: Provide where shown not less than R19 unless otherwise indicated on Drawings. Thicknesses shall be as determined by manufacturer for "R" value specified. More than one layer of insulation may be used to achieve the specified "R" value.
- H. Vapor Retarder Tapes: Vapor seal tape shall be compatible with specified facer and comparable perm rating. Provide Thermafiber® Aluminum Foil and/or FSK Tape for taping insulation joints and repairing tears.
- I. Exposed Insulation: Where exposed, insulation shall meet the requirements of Factory Mutual (FM).

2.02 METAL BUILDING INSULATION

- A. Manufacturer: Owens Corning Insulating Systems, LLC, One Owens Corning Parkway, Toledo, OH 43659, (800)438-7465 or (419)248-8000; www.owenscorning.com.
 - 1. Product: OptiLiner®, Banded Liner System.
 - 2. Owens Corning shall approve all materials used in the OptiLiner® Banded Liner System. Contact Owens Corning for specific materials approved for use within the OptiLiner® Banded Liner System.
 - 3. Comparable Products: Insulation by manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.
- B. Materials: OptiLiner® System consists of the following.
 - 1. Unfaced light density fiberglass metal building insulation in one of the following categories:
 - a. Owens Corning Certified R Metal Building Insulation.
 - 1) Complies with ASTM C991 Type 1.
 - 2) Complies with NAIMA 202-96-REV 2000.
 - 3) Flame Spread Index <25 and Smoke Developed Index <50 when tested in accordance with ASTM E84, NFPA 255 and UL 723.

- 4) Certified by SCS Global Services to contain a minimum of 65% recycled glass content, 18% pre-consumer and 47% post-consumer.
 - 5) Unfaced.
 - 6) GREENGUARD Indoor Air Quality Certified®.
 - 7) GREENGUARD Gold Certified.
 - b. Owens Corning MBI Plus Metal Building Insulation.
 - 1) Flame Spread Index <25 and Smoke Developed Index <50 when tested in accordance with ASTM E 84, NFPA 255 and UL 723.
 - 2) Certified by SCS Global Services to contain a minimum of 65% recycled glass content, 18% pre-consumer and 47% post-consumer.
 - 3) Unfaced.
 - 4) GREENGUARD Indoor Air Quality Certified®.
 - 5) GREENGUARD Gold Certified.
 - c. Owens Corning Metal Building Utility Blanket.
 - 1) Flame Spread Index <25 and Smoke Developed Index <50 when tested in accordance with ASTM E 84, NFPA 255 and UL 723.
 - 2) Certified by SCS Global Services to contain a minimum of 65% recycled glass content, 18% pre-consumer and 47% post-consumer.
 - 3) Unfaced.
 - 4) GREENGUARD Indoor Air Quality Certified®.
 - 5) GREENGUARD Gold Certified.
2. Fabric liner facing/vapor barrier composed of woven high-density polyethylene coated on both sides with polyethylene. Complies with the following:
 - a. ASTM C1136, Types I through Type VI.
 - 1) Type I-IV exception for dimensional stability (value is <2.0%).
 - b. Perm Rating: ≥ 0.02 when tested in accordance with ASTM E 96 Procedure A.
 - c. Flame Spread Index <25 and Smoke Developed Index <50 when tested in accordance with ASTM E 84.
 - d. Color:
 - 1) White.
3. Vapor barrier adhesive. Complies with the following:
 - a. Application temperature 10°F to 110°F.

4. Double sided vapor barrier tape. Complies with the following:
 - a. Width 0.75".
 - b. Rubber based and free film.
5. Patch Tape. Complies with the following:
 - a. Adhesive added to one side.
 - b. Installation temperature from 10°F to 110°F.
 - c. 3" width.
6. Metal Banding/Straps: Complies with the following:
 - a. Coated Steel.
 - b. 1.0" wide.
 - c. Structural Steel Grade 50 per ASTM C 653.
 - d. Exposed color to match vapor barrier.
 - 1) White.
 - 2) Backing - gray.
7. Thermal Breaks:
 - a. Thermal Spacer Blocks: Complies with the following:
 - 1) Extruded or expanded polystyrene.
 - 2) Minimum width 3.0".
 - 3) Thickness 0.5" - 1.0"
8. Light Gage Steel Fasteners:
 - a. Zinc plated cold forged steel.
 - b. Head color to match vapor barrier.
 - 1) White.
 - c. Contain rubber sealing washer.
9. Heavy Gage Steel Fasteners:
 - a. Zinc plated cold forged steel.
 - b. Head color to match vapor barrier.
 - 1) White.
 - c. Contain rubber sealing washer.

10. Insulation Hangers:
 - a. Insul-hold insulation hangers.
11. Thermal Resistance: Refer to Drawings.

PART 3 - EXECUTION

3.01 BLANKET/BATT INSULATION INSTALLATION

- A. General: Install blanket/batt insulation at wood and/or metal stud framed exterior building walls, and other locations as indicated on Drawings and/or required by field conditions.
 1. Metal Stud Framing: Install insulation between studs, from interior side of wall recessed slightly from stud faces. Secure to studs to prevent sagging, in accordance with manufacturer's recommendations.
 2. Voids in Building Construction: Fill voids in building construction with blanket insulation, at locations indicated on the Drawings and/or required by field conditions, such as between top of walls and underside of metal deck; between top of structural steel members and underside of deck, between exterior face of structural steel member and exterior construction.
 3. Discontinued Framed Areas: Where insulation must extend higher than metal stud framing support; manufacturer's recommended galvanized steel clips shall be provided to continue and hold insulation in place and prevent sagging. Insulation shall continue and extend between top of metal stud framing and structural steel members as shown on the Drawings.
 4. Expansion Joint Voids: Batt insulation shall be furnished to the Sheet Metal Contractor for filling void of expansion joint as shown on the Drawings.
- B. Vapor Retarder Installation: Seal all joints in exterior wall insulation with vapor retarder tape. Apply vapor retarder tape in accordance with manufacturer's printed specifications and instructions, at intersection of insulation with framing, adjacent pieces and similar intersections to insure a vapor tight seal. Repair all tears in insulation foil facing with vapor retarder tape.

3.02 METAL BUILDING ROOF INSULATION INSTALLATION

- A. Examination
 1. Examine the areas and conditions under which work of this section will be installed. Verify that adjacent materials are dry and ready to receive insulation. Verify structure, bracing, and concealed building systems have been tested and inspected.
 2. Provide written report listing conditions detrimental to performance of work in this section. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Installation
 1. Install liner system in accordance with manufacturer's installation instructions and approved Shop Drawings.
 2. Purlin and girt attachment surfaces should be clean and dry prior to attaching two-faced tape or sealing adhesive.
 3. Installed fiberglass insulation should fit snugly against purlin and girt walls in the cavity space. Avoid gaps, voids and any excess compression.

C. Cleaning

1. Clean dirt from vapor barrier fabric using a soft cloth with soap and water or non-abrasive household cleaner. Solvent-based cleaners and abrasive pads should be avoided.

D. Safety Precautions

1. Installation contractor must have a site-specific safety plan and comply with all OSHA applicable local rules and regulations when installing this system.
2. Workers must use OSHA required fall protection when installing the banded liner system at heights (see OSHA regulations at 29 CFR 1926, Subpart M).
3. Banding has sharp edges and cut proof gloves should be worn when handling.

3.03 CLEAN-UP

- A. Work Required: Clean-up any Work soiled in the performance of the Work under this section.
- B. Debris and Waste Materials: During progress of the Work, upon completion of Work, and before final acceptance of the Work, keep the premises free of debris and waste materials resulting from Work of this section. Remove all debris and rubbish to central area designated by the General Contractor, for general clean-up by the General Contractor, or if directed by the General Contractor to remove from the site and legally dispose.
- C. Unused Materials, Tools, and Equipment: Upon completion of Work and before final acceptance of the Work, remove all unused materials, tools, and equipment from the site.

END OF SECTION

SECTION 07 21 13BOARD INSULATION

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, and services necessary for Board Insulation Work indicated on the Drawings and as specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Rigid Insulation for below grade and above grade installations.
 - 2. Exterior Insulation Sheathing.
- B. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:
 - 1. Concrete Foundation Work - Section 03 00 50.
 - 2. Concrete Work - Section 03 30 00.
 - 3. Cold-Formed Metal Framing - Section 05 40 00.
 - 4. Rough Carpentry Work - Section 06 10 00.
 - 5. Non-Structural Metal Stud Framing - Section 09 22 16.
 - 6. Gypsum Sheathing Panels and Wallboard Construction - Section 09 29 00.

1.02 SUBMITTALS

- A. General: Submit manufacturer’s literature to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Manufacturer’s Literature: Submit three (3) sets of manufacturer’s specification data for each type of insulation specified herein.

1.03 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver only acceptable materials to the site in original boxes and wrappings, clearly labeled with all pertinent information to facilitate checking.
- B. Storage: Store materials at the site off the ground and in properly protected dry storage facilities, until ready for use. Provide a tarpaulin covering over the materials, securely tied down. Wet, damp, or damaged materials shall not be used.
- C. Product Handling:
 - 1. Protect insulation from physical damage.
 - 2. Comply with manufacturer’s recommendations for handling, storage and protection.

3. Handle boards carefully so corners are not broken off or boards otherwise damaged.

1.04 SCAFFOLDING

- A. As required by conditions; Provide, erect, and maintain all scaffolding, ladders, etc., all in accordance with the standards of all governing local, state, and national safety codes, as required for the performance of all Work of this section of the Specifications. Such equipment shall be erected at times and locations so as not to delay any part of this or any other Work. When no longer required, promptly dismantle the equipment and remove same from the site.

1.05 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form warranting all materials and workmanship to remain in serviceable and satisfactory condition, and make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

PART 2 - PRODUCTS

2.01 RIGID INSULATION

- A. Foundation Insulation: Rigid foam insulation for below grade installation shall be extruded polystyrene closed-cell foam panel boards, square edge, manufacturer's standard board size 48" widths x 96" lengths, with a minimum "R" value of 15.0, unless otherwise indicated on the Drawings. Use one of the following for all Work.
 1. Extruded Polystyrene Foam Insulation: Provide insulation in compliance with ASTM Standard C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation, Type IV, 25 psi minimum compressive strength. Insulation shall be moisture resistant, with "R" value 5.0 and Thermal Conductivity "K" Value of 0.20, per inch of product thickness. Flame spread Value shall be not more than 5 and a smoke developed Value of not more than 45 to 175 where tested in the maximum thickness intended for use in accordance with ASTM Standard E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 2. Manufacturers: Provide fresh insulation as manufactured by one of the following.
 - a. Foamular® 250, by Owens Corning, Insulation, LLC, One Owens Corning Parkway, Toledo, OH 43659, (800)438-7465 or (419)248-8000; www.owenscorning.com.
 - b. STYROFOAM™ Brand Extruded Polystyrene Foam (XPS) Square Edge Insulation by The Dow Chemical Company, Dow Building Solutions, 200 Larkin, Midland, MI 48674, (800) 232-2436 or (866) 583-2583; www.dowbuildingsolutions.com.
- B. Exterior Insulation Sheathing:
 1. Manufacturer: The Dow Chemical Company, Building & Construction, 200 Larkin, Midland, MI 48674, (800)232-2436 or (866)583-2583; www.dowbuildingsolutions.com.

2. Products: Provide 1/2" 1" (nominal board thickness) square edge rigid board insulation of manufacturer's standard length and width most practical and economical for installation. Rigid insulation shall be Factory Mutual Approved, "THERMAX™ Sheathing" polyisocyanurate insulation, non-structural, rigid board insulation consisting of a glass-fiber-reinforced polyisocyanurate foam core laminated between pinhole-free solid aluminum foil facers. Thermal resistance shall be 3.3 stabilized R-value of core foam at 75°F mean temperature determined in accordance with ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

2.02 ACCESSORIES

- A. Adhesive: Provide adhesive for rigid board perimeter foundation insulation. Adhesive type shall be as recommended by the insulation manufacturer for the application involved.
- B. Z-Furring Channels: Furring members shall be not less than 20 gauge corrosion resistant galvanized steel, conforming to ASTM Standards A653 and A754, of furring widths (depths) as required and/or noted on the Drawings to fit insulation thickness indicated.
 1. Manufacturer: ClarkDietrich™ Building Systems, 9100 Centre Pointe Drive, Suite 210, West Chester, OH 45069, (800)543-7140 or (513)870-1100; www.clarkdietrich.com.
 2. Product: Interior Framing Product, Z-Furring Channel.

PART 3 - EXECUTION

3.01 RIGID INSULATION INSTALLATION - GENERAL

- A. Foundation Insulation: Install rigid insulation below grade at building perimeter concrete slabs and foundation walls as indicated on Drawings.
 1. At exterior wall foundation areas, install insulation panels horizontally at concrete slabs as indicated on the Drawings, with butt joints on level, compacted fill and vapor barrier installed by others.
 2. Remove concrete fins and mortar projections that interfere with placement of insulation boards.
 3. Where insulation is installed vertically on perimeter foundation walls, adhere boards to concrete surfaces by applying 2" diameter spots or ribbons of adhesive to insulation boards with adhesive of type recommended by the board manufacturer, 16" O.C. both ways. Butt end joints together tightly.
 4. Cut insulation to fit snugly around all projections and irregularities on the wall surfaces. Fill voids with insulation.
- B. Exterior Insulation Sheathing: Install rigid insulation on gypsum board sheathing at building exterior wall construction where indicated on Drawings, and as recommended by the board manufacturer.

3.02 CLEAN-UP

- A. Work Required: Clean-up any Work soiled in the performance of the Work under this section.
- B. Debris and Waste Materials: During progress of the Work, upon completion of Work, and before final acceptance of the Work, keep the premises free of debris, excess insulation, wrappings and other waste materials resulting from Work of this section. Remove all construction debris and rubbish to central

area designated by the General Contractor, for general clean-up by the General Contractor, or if directed by the General Contractor to remove from the site and legally dispose.

- C. Unused Materials, Tools, and Equipment: Upon completion of Work and before final acceptance of the Work, remove all unused materials, tools, and equipment from the site.

END OF SECTION

SECTION 07 21 19FOAMED-IN-PLACE INSULATION

The requirements of the “General Conditions”, the Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, equipment, apparatus, tools, transportation, protection, and services necessary for Foamed-In-Place Insulation Work required for new masonry and at other locations as indicated on Drawings and specified herein. Work includes, but is not limited to the following:
1. Masonry Insulation.
 2. Mortar Materials.
- B. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:
1. Structural Precast Concrete - Section 03 41 13.
 2. Masonry - Section 04 20 00.
 3. Joint Protection - Section 07 90 00.
 4. Gypsum Wallboard Construction - Section 09 29 00.
 5. Interior Painting and Finishing - Section 09 91 23.

1.02 QUALITY ASSURANCE

- A. Foamed-In Place Insulation:
1. Manufacturing Standards: Provide insulation produced by a single and approved manufacturer. The product must come from the manufacturer pre-mixed to ensure consistency.
 2. Installer Qualifications: Engage an experienced dealer/applicator who has been trained and licensed by the product manufacturer for foamed-in-place insulation and which has not less than three (3) years direct experience in the installation of the product used and the equipment required.
 3. Warranty: Upon request, not less than a one (1) year product and installation warranty shall be issued by both the manufacturer and installer.
 4. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, in accordance with methods indicated below, by a testing agency acceptable to authorities having jurisdiction.

- a. Classification and Surface Burning Characteristics: Product must be classified by Underwriters Laboratories, Inc. ("UL®") as to Surface Burning Characteristics.

- 1) Fire Resistance Ratings: ASTM Standard E119.
- 2) Surface Burning Characteristics: ASTM Standard E84.
- 3) Combustion Characteristics: ASTM Standard E136.

1.03 SUBMITTALS

- A. General: Submit Product Data to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Product Data: Submit manufacturer's product and technical literature for review, including products specified herein.
- C. Foamed-In-Place Insulation:
 - 1. Product and Technical Presentation: Submit as provided by the manufacturer.
 - 2. Certified Test Reports: Submit with Product Data, copies of certified test reports showing compliance with specified performance values, including R-values, fire performance and sound abatement characteristics.
 - 3. Material Safety Data Sheet: Submit Material Safety Data Sheet complying with Occupational Safety and Health Administration (OSHA) Hazard Communication Standard, 29 CFR 1910.1200.

1.04 PRODUCT DELIVERY, HANDLING AND STORAGE

- A. Delivery: Deliver all products, materials, accessories, etc. at location designated by the General Contractor.
- B. Storage: Store all products and materials at the site above the ground. Cover all materials with waterproof coverings, in such a manner that will prevent water absorption from both rain and from condensation. Handle all materials in a manner that will prevent damage to same. Do not place materials directly on ground. Do not dump materials in piles. Damaged materials will not be acceptable, and shall be removed from the site.
- C. Material Shelf Life: Do not retain material at the jobsite which has exceeded the shelf life recommended by the manufacturer.

1.05 SCAFFOLDING

- A. As required by field conditions; provide, erect, and maintain all scaffolding, ladders, etc., all in accordance with the standards of all governing local, state, and national safety codes, as required for the performance of all Work of this section of the Specifications. Such equipment shall be erected at times and locations so as not to delay any part of this or any other Work. When no longer required, promptly dismantle the equipment and remove same from the site.

1.06 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense, any imperfections which may develop during the warranty period, as well as damage to other Work caused by imperfections or repairing of imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance of the installation.

PART 2 - PRODUCTS

2.01 MASONRY INSULATION

A. Foamed-In-Place Insulation:

1. Manufacturer: Insulation specified herein shall be as manufactured by Tailored Chemical Products, Inc., P.O. Box 4186, Hickory, NC 28603, (828)322-6512 or (800) 627-1687; www.core-fill500.com.
 - a. Comparable Manufacturers and Products: Insulation by the following manufacturer with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.
 - 1) CfIFOAM, Inc., P.O. Box 10393, Knoxville, TN 37939, (800)656-3626, www.cfifoam.com.
2. Insulating Materials:
 - a. General: Provide insulating materials which comply with requirements indicated for materials, compliance with referenced standards, and other characteristics as specified herein. Insulation shall contain no polystyrenes, polyisocyanurates, polyurethane or petrochemicals.
 - b. Foamed-In-Place Masonry Wall Insulation: Core-Fill 500™ two-component thermal insulation produced by combining a plastic resin and catalyst foaming agent surfactant which, when properly ratioed and mixed, together with compressed air produce a cold-setting foam insulation in the hollow cores of hollow unit masonry walls. Provide insulation materials with not less than the following minimum product performance standards.
 - 1) Fire-Resistance Ratings: Minimum four (4) hour fire resistance wall rating (ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials) for 8" and 12" concrete masonry units when used in standard two (2) hour rated concrete masonry units (CMU).
 - 2) Surface Burning Characteristics: Maximum flame spread 0, smoke developed 5 and fuel contributed 0 respectively; ASTM Standard E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 3) Combustion Characteristics: Products must be noncombustible, Class A building material; ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750° C.

- 4) Thermal Values: Provide not less than a "R" Value of 4.91 per inch at 32 degrees F mean; ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
- 5) Sound Abatement: Minimum Sound Transmission Class ("STC") rating of 53 and a minimum Outdoor Indoor Transmission Class ("OITC") rating of 44 for 8" wall assembly (ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements).

2.02 MORTAR MATERIALS

- A. Cement: An approved brand of Type I Portland Cement conforming to ASTM C150 - Standard Specification for Portland Cement.
- B. Lime: An approved brand of hydrated lime conforming with ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
- C. Sand: Rescreened, clean, sharp, washed materials, free from deleterious substances, conforming with ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
- D. Mortar Mix: Mortar shall conform to ASTM C270 - Standard Specification for Mortar for Unit Masonry, Type S.
- E. Mixing Water: Potable water (suitable for drinking) shall be clean, free from oils, alkalies, acids, organic water, or other deleterious materials.
- F. Admixtures:
 1. Air-entrained admixtures or material containing air-entrained admixtures are prohibited. Air content shall be limited to 12%.
 2. No anti-freeze compounds or other substances containing chlorides shall be added to mortar.

2.03 PROPORTIONS AND USE OF MORTAR

- A. Mortar Type: For all masonry, except as otherwise listed below, provide Type S mortar conforming to ASTM Standard C270. Minimum strength of mortar shall be 1800 2000 psi at 28 days. Type N mortar is acceptable for veneers and reinforced concrete masonry units.
- B. Cement Lime Mortar For Below Grade Masonry Work: Cement lime mortar shall be proportioned one part cement; 1/4 part lime; 3 parts damp, loose sand, by volume.
- C. Cement Lime Mortar For All Other Masonry Work: Cement lime mortar shall be proportioned one part cement; one part lime; 6 parts damp, loose sand, by volume.

PART 3 - EXECUTION

3.01 MASONRY INSULATION

A. Foamed-In-Place Insulation:

1. General: Block masonry at building exterior walls where and as indicated on the Drawings shall be provided with approved foamed-in-place injected insulation as specified herein. Unless otherwise noted on the Drawings, install foamed-in-place insulation from interior, prior to installation of interior finish Work and after all masonry and structural concrete Work is in place. Insulation shall be installed in accordance with the manufacturer's recommendations and instructions.
2. Installation: Fill all open cells and voids in hollow concrete masonry walls where shown on Drawings. Foam insulation shall be pressure injected through a series of horizontal rows of 5/8" to 7/8" holes drilled into the mortar joints for every vertical column of block cells (every 8" on center) beginning at an approximate height of four (4) feet from finished floor level along the entire wall area. As required by the Drawings and/or field conditions; repeat this procedure at an approximate height of ten (10) feet above the first horizontal row of holes or at any convenient interval until the void is completely filled. The height of each interval shall not exceed ten (10) feet. Fill all cavities up to roof line.
3. Drilled Holes: Patch all holes with mortar and retool mortar courses to resemble and match existing surface.

3.02 MORTAR MIXING

- A. All mortar materials shall be accurately measured and mixed in a mechanical batch mixer, in the proportions specified and to a uniform consistency.
- B. All materials shall be measured by volume, and, for this purpose 40 lbs. of hydrated lime shall equal 1 cu. ft.
- C. Mortar shall not be mixed in greater quantities than required for immediate use, as no retempering of mortar will be allowed.
- D. The use of salt, chlorides, anti-freezing or set accelerating mixture in mortar is prohibited.

3.03 CLEAN-UP

- A. Work Required: Clean-up any Work soiled in the performance of the Work under this section.
- B. Debris and Waste Materials: During progress of the Work, upon completion of Work, and before final acceptance of the Work, keep the premises free of debris and waste materials resulting from Work of this section. Remove all debris and rubbish to central area designated by General Contractor, for general clean-up by General Contractor, or if directed by General Contractor to remove from the site and legally dispose.
- C. Unused Materials, Tools, and Equipment: Upon completion of Work and before final acceptance of the Work, remove all unused materials, tools, and equipment from the site.

END OF SECTION

SECTION 07 24 00EXTERIOR INSULATION AND FINISH SYSTEM

The requirements of the "General Conditions", the "Supplementary Conditions", and "Division 1" sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, equipment, and services necessary for field applied Exterior Insulation and Finish System (EIFS) Work indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Exterior Insulation and Finish System (EIFS) for installation on new construction.
- B. Color Selections: Refer to the Drawings.
- C. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:
 - 1. Masonry Work - Section 04 20 00.
 - 2. Load Bearing Cold-Formed Metal Framing - Section 05 40 00.
 - 3. Miscellaneous Metal - Section 05 50 00.
 - 4. Rough Carpentry - Section 06 10 00.
 - 5. Sheet Metal Work - Section 07 60 00.
 - 6. Sealants - Section 07 90 00.
 - 7. Entrances and Storefronts - Section 08 41 00.
 - 8. Exterior Gypsum Board Sheathing - Section 09 29 00.
 - 9. Exterior Painting and Finishing - Section 09 91 13.
 - 10. Metal Building Systems - Section 13 34 19.
 - 11. Exterior Light Fixtures - Division 26.

1.02 APPLICABLE STANDARDS

- A. Codes and Reference Specifications: Except as otherwise specified herein, material and workmanship shall conform to the following current codes and specifications.
 - 1. All applicable Local Building Codes and Ordinances.
 - 2. American National Standards Institute ANSI 42.2, on Cement Stucco, with regards to size and placement of control joints.
 - 3. ASTM International Standard Specifications referred to herein by number.
 - 4. ICC-Evaluation Service, Inc. (ICC-ES), ICC-ES Evaluation Reports.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer with not less than five (5) years experience who is certified in writing by system manufacturer, as qualified to install manufacturer's system.
- B. Single-Source Responsibility: To ensure consistent quality of appearance and performance, obtain material from a single manufacturer who is a member of the Exterior Insulation Manufacturers Association (EIMA). Manufacturer shall be ISO 9001 Certified.
- C. Field-Constructed Mock-Up: Prior to installation of system, erect mock-ups for each form of wall construction and finish required to verify selections made under Sample submittals and to demonstrate esthetic effects, including those related to execution. Build mock-ups to comply with the following requirements, using materials indicated for final Work:
 - 1. Locate mock-ups on-site in location and of size indicated, or if not indicated, as directed by Architect.
 - 2. Demonstrate the proposed range of color, texture, and workmanship to be expected in completed Work.
 - 3. Obtain Architect's acceptance of mock-ups before start of final Work.
 - 4. Retain and maintain mock-ups during construction for judging completed Work.
 - 5. When directed by Architect, demolish mock-ups and remove from Project site.
- D. Field Quality Control: Retain the services of system manufacturer's field service support to make periodic on-site inspections to ensure materials are installed in accordance with manufacturer's specifications. Manufacturer's inspector shall perform field surveys and submit Field Reports to Architect stating applicator's compliance with manufacturer's specifications, and corrective actions if required, prior to completion of Work and issuance of System Warranty.
- E. Standards: All exterior building materials and systems shall meet local building code requirements for fire spread, uplift resistance, and wind loads.

1.04 SUBMITTALS

- A. General: Submit the following Shop Drawings, Product Data, and Samples to Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples and as specified herein. Work shall not begin until Shop Drawings have been reviewed by the Architect.
 - 1. Shop Drawings: Provide drawings showing fabrication and installation of systems including plans, elevations, sections, details of components, joint locations and configurations within system and between system and construction penetrating it, and attachments to construction behind system.
 - 2. Product Data: Provide manufacturer's Product Data sheets for each component of Exterior Insulation and Finish System; describing products, which will be used on this Project.
 - 3. Samples for Verification Purposes: Provide in the form of 1 foot square panels for each finish, color, and texture specified. Prepare Samples using same tools and techniques intended for actual Work. Incorporate within each sample a typical control joint filled with sealant of color indicated or selected.

4. Qualification Data: Provide data on firms and persons as specified herein under Article "QUALITY ASSURANCE" to demonstrate capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, plus other information specified.
5. Installation and Installer Certificates: Provide Letter of Certification for the EIFS installation from the EIFS manufacturer to ensure proper installation. Provide certificates signed by manufacturer certifying that Installers comply with requirements as specified herein under Article "QUALITY ASSURANCE".
6. Product Test Reports: Provide test reports from, and based on tests performed by qualified Independent Testing Laboratory evidencing compliance of components and systems with requirements based on comprehensive testing within last three (3) years of current product formulations and systems.
7. Research Reports or Evaluation Reports: Provide reports of the model code organization acceptable to authorities having jurisdiction that evidence system's compliance with building code in effect for the Project.

1.05 PRODUCT DELIVERY AND STORAGE

- A. Delivery: Deliver products in original, unopened packages with manufacturer's labels legible and intact identifying products.
- B. Storage:
 1. Store materials inside, or under cover and off the ground to keep dry, protected from the weather, direct sunlight, surface contamination, damaging temperatures, damage from construction traffic and other causes.
 2. Insulation board shall be stacked flat, a minimum of 8" off the ground, protected from the sun.
 3. Pail materials shall be stored in temperatures not less than 40°F or more than 110°F.

1.06 INSPECTION

- A. General: Carefully inspect all surfaces upon which the Work is to be applied and notify the General Contractor in writing, of any conditions detrimental to the installation of Work. Installation of any materials will be interpreted as Contractor's acceptance of the surface. If any defective Work, which harmfully affects the Work, is covered in, the removal and replacement of the Work shall be done by this Contractor without cost to the Owner.

1.07 SCAFFOLDING

- A. Furnish, erect, and maintain all scaffolding and ladders in accordance with the standards of applicable local, state, and national safety codes. Erect equipment at times and locations so as not to delay any part of Work. When no longer required, promptly dismantle equipment and remove from site.

1.08 PROJECT CONDITIONS

- A. Protect contiguous Work from moisture and from soiling which might result from application of exterior insulation and finish systems. Provide temporary covering necessary to protect against harmful spattering of exterior finish coatings on other Work.

- B. Protect substrate and exterior insulation and finish system from effects of inclement weather during and until installation is completed, including flashing, joint sealers and other related Work required to prevent infiltration of moisture behind system or deterioration of substrates over which the system is applied.
- C. Do not install exterior insulation and finish system when substrate and ambient outdoor temperatures are 40°F or less, unless temporary protection and heat can be provided to maintain ambient temperatures of 40°F and above, during, and for a minimum of 72 hours after, installation of wet materials. Longer periods of protection may be necessary until the finish is thoroughly dry and can be safely exposed to weather conditions.

1.09 PRE-INSTALLATION MEETING

- A. At Architect's discretion, installer, system manufacturer's technical representative, installer of substrate material and other trades whose Work affects exterior insulation and finish system, shall meet at Project site to review procedures and time schedule proposed for installation of the system and coordination with related Work.

1.10 WARRANTY

- A. Form of Warranty: Execute a Systems Warranty stating the products sold or manufactured, when properly applied by a manufacturer's approved applicator, in accordance with manufacturer's procedures and applicable specifications, shall be free from defects for a period of not less than five (5) years from date of Owner's acceptance. System Manufacturer's responsibility shall be to supply replacement materials and labor for any warranted product shown to be defective within the warranty period.

PART 2 - PRODUCTS

2.01 MANUFACTURER AND SYSTEMS

- A. Manufacturer: Dryvit® Systems, Inc., One Energy Way, West Warwick, RI 02893, (401)822-4100 or (800)556-7752; www.dryvit.com.
- B. System Description: Field applied Dryvit® Outsulation® MD System®, Exterior Insulation and Finish System (EIFS), Class PB, with capability for moisture drainage. The system shall consist of a water-resistive barrier coating (air/weather resistive barrier) with materials and components as specified herein establishing the commercial standard of quality and performance required.
 - 1. Performance Requirements: The EIFS System shall have been tested in accordance with, but not necessarily limited to the following durability test(s).
 - a. Water Penetration: Tests methods in accordance with ASTM Standard E331 and ICC ES (AC 219 - Acceptance Criteria for EIFS); resulting with no water penetration beyond the inner-most plane of the wall after two (2) hours at 299 Pa (6.24psf).
- C. Comparable Manufacturers and Systems: EIFS systems by the following manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.
 - 1. Finestone® or Senergy®, by BASF Corporation - BASF Wall Systems, 3550 St. John's Bluff Road South, Jacksonville, FL 32224-2614, (800)221-9255; www.finstone.basf.com or www.senergy.basf.com.
 - 2. Parex USA, Inc., 4125 E. LaPalma Avenue, Suite 250, Anaheim, CA 92807, (866)516-0061 or (714)778-2266; www.parex.com.

3. Sto® Corp., 3800 Camp Creek Parkway SW, Building 1400, Suite 120, Atlanta, GA 30331, (404)346-3666 or (800)221-2397; www.stocorp.com.

2.02 MATERIALS

- A. Portland Cement: Type I or II, meeting ASTM Standard C150; white or gray in color, fresh and free of lumps and foreign matter.
- B. Water: Potable water (suitable for drinking) shall be clean, free from oils, alkalies, acids, organic water, or other deleterious materials.

2.03 COMPONENTS

- A. Air/Weather Resistive Barrier Components:
 1. Dryvit Backstop® NT: A flexible, polymer-based, noncementitious, water-resistive coating available in Texture, Smooth and Spray.
 2. Dryvit Grid Tape™: An open weave fiberglass mesh tape with pressure sensitive adhesive available in rolls 102 mm (4 in) wide by 91 m (100 yds) long.
- B. Flashing Materials: Used to protect substrate edges at terminations.
 1. Liquid Applied: An extremely flexible water-based polymer material, ready for use.
 - a. Shall be AquaFlash® Liquid and AquaFlash Mesh.
 2. Sheet Type:
 - a. Shall be Flashing Tape and Surface Conditioner.
 - 1) Dryvit Flashing Tape™: A high density, polyethylene film backed with a rubberized asphalt adhesive, available in rolls 102 mm (4 in), 152 mm (6 in) and 229 mm (9 in) wide by 23 m (75 ft) long.
 - 2) Dryvit Flashing Tape Surface Conditioner™: A water-based surface conditioner and adhesion promoter for the Dryvit Flashing Tape.
- C. Adhesives: Used to adhere the expanded polystyrene (EPS) insulation board to the air/water-resistive barrier, shall be compatible with the air/water-resistive barrier and the EPS.
 1. Cementitious: A liquid polymer-based material, which is field mixed with Portland Cement for use over non wood-based substrates.
 - a. Shall be Primus®, Genesis® or Genesis® FM.
 2. Ready Mixed: A dry blend cementitious, copolymer-based product, field mixed with water; for use over non wood-based substrates.
 - a. Shall be Primus® DM, Genesis® DM, Genesis® DMS, Rapidry DM 35-50 or Rapidry DM 50-75.
 3. Noncementitious Adhesive for EPS: A factory-mixed, noncementitious, water-based acrylic copolymer adhesive; for use over wood-based substrates.
 - a. Shall be ADEPS®.

- D. Insulation Board: Expanded Polystyrene (EPS) Insulation Board with less than 25 Flame Spread and less than 450 Smoke Development. Insulation board shall be manufactured by an approved board supplier as listed by the EIFS system manufacturer. Insulation board shall be in compliance with ASTM Standards E2430, C578, Type 1 and ASTM Standard E84 or UL-723; minimum density of 0.95 pounds per cubic foot; K=0.23 per inch. Back side of the insulation board shall have 1/4" x 1" grooves running vertically and spaced 12" on center. Insulation board shall be aged by air drying for six (6) weeks before use.
1. Board Thicknesses: Shall be not less than 2" for MD System and as indicated on the Drawings, and shall be within tolerance of plus or minus 1/16".
 2. Size: Nominal 24" wide x 48" long.
 3. Edge Trueness and Squareness: Insulation board shall be furnished with true edges and squareness and shall not deviate more than 1/32" in 12".
 4. Face Flatness: Insulation board shall be furnished flat and shall not exhibit any bowing of more than 1/32" in the length.
- E. Insulation Board Closure Blocks: Expanded Polystyrene meeting Specification for Insulation Board as specified herein. The Closure Blocks shall measure a minimum of 152 mm (6 in) in height.
- F. Dryvit Starter Strip™: A 51 mm x 152 mm x 1.2 m (2 in x 6 in x 4 ft) piece of aged expanded polystyrene configured to receive the Dryvit Track™ and Vent Track™. Provide at the base of all walls, at base of horizontal terminations, and heads of windows and other openings.
- G. Dryvit Vent Assembly: A 51 mm x 152 mm x 305 mm (2 in x 6 in x 12 in) piece of aged expanded polystyrene, which is configured to contain a formed aggregate matrix material and receive the Dryvit Vent Track™. Provide at the base of walls and the base of horizontal terminations for drainage of water.
- H. Dryvit AP Adhesive™: A moisture cure urethane-based adhesive used to attach the Dryvit Track and Vent Track to the Backstop NT.
- I. Dryvit Track™: A "J" shaped track complying with ASTM Standard D1784 and ASTM Standard C1063 located above the Dryvit Starter Strip.
- J. Dryvit Vent Track™: A "J" shaped track complying with ASTM Standard D1784 and ASTM Standard C1063 containing a slot for drainage and located above the Dryvit Vent Assembly, along the base of walls and horizontal terminations.
- K. Base Coat: Shall be compatible with the EPS insulation board and reinforcing mesh(es).
1. Cementitious: A liquid polymer-based material, which is field mixed with Portland Cement.
 - a. Shall be Primus®, Genesis® or Genesis® FM.
 2. Noncementitious: A factory-mixed, fully formulated, water-based product.
 - a. Shall be NCB™.
 3. Ready Mixed: A dry blend cementitious, copolymer-based product, field mixed with water.
 - a. Shall be Primus® DM, Genesis® DM, Genesis® DMS, Rapidry DM 35-50 or Rapidry DM 50-75.

- L. Reinforcing Meshes: Provide reinforcing meshes, balanced, open weave, glass fiber fabric treated for compatibility with other system materials. Impact resistance for meshes shall be in accordance with ASTM E2486 - Standard Test Method for Impact Resistance of Class PB and PI Exterior Insulation and Finish Systems (EIFS) and EIMA (EIFS Industry Members Association) Classifications as specified herein.
1. Standard Mesh: EIMA Classification “Standard” impact resistance mesh; used to reinforce wall areas, shall weigh a minimum of 4.3 oz./sq. yd. and have a minimum tensile strength of 150 lbs./inch.
 2. Standard Plus Mesh: EIMA Classification “Medium” impact resistance mesh; used for normal impact resistance shall weigh a minimum of 6 oz./sq. yd. and have a minimum tensile strength of 200 lbs./inch.
 3. Intermediate Mesh™: EIMA Classification “High” impact resistance mesh; used for moderate impact resistance, shall weigh a minimum of 12 oz./sq. yd. and have a minimum tensile strength of 300 lbs./inch.
 4. Panzer® 20 Mesh: EIMA Classification “Ultra High” impact resistance mesh; used where high impact resistance is needed, shall weigh a minimum of 20.5 oz./sq. yd. and have a minimum tensile strength of 550 lbs./inch. Panzer® 20 Mesh shall be used in conjunction with Standard Mesh and Standard Plus Mesh.
 5. Corner Mesh™: Used for additional impact resistance at corners, shall weigh a minimum of 7.2 oz./sq. yd. and have a minimum tensile strength of 274 lbs./inch.
 6. Detail Mesh®: Used for special shapes and irregular detail Work, shall have a minimum tensile strength of 150 lbs./inch.
- M. Finishes: Factory-mixed, water-based acrylic finish coating with integral color and texture, formulated with DPR (Dirt Pickup Resistance) chemistry, and subject to review by the Architect.
1. Finish Texture: Sandblast® DPR, as noted on the Drawings.
 2. Colors: Refer to Color Legend on the Drawings and as required to match existing colors.
 3. Colors: Shall be Dryvit® colors as specified herein and shall be subject to approval by the Architect and/or Owner.
 - a. Field: As selected by the Architect.
- N. Additives: Rapid binders, anti-freeze, accelerator, and other additives shall not be added to any materials.
- O. Trim Accessories: Unless otherwise specified, “J” and drip channels, expansion joints, and corner beads manufactured of zinc, shall be as recommended by the EIFS system manufacturer for installations as indicated on Drawings and/or required by field conditions.
- P. Mechanical Fastener Assemblies: System manufacturer’s standard corrosion-resistant fastener assemblies, consisting of thermal cap, standard washer and shaft attachments, and fastener indicated below; selected for properties of pullout, tensile, and shear strength required to resist design loads of application indicated, capable of pulling fastener head below surface of insulation board, and of the following description:
1. Where required; for attachment to concrete or masonry substrates, provide sheathing dowel in the form of plastic wing-tipped fastener with thermal cap, sized to fit insulation thickness indicated and penetrate substrate to depth required to secure anchorage.

2. For attachment to steel studs from 0.033 inch to 0.112 inch thick, provide steel drill screws complying with ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
3. For attachment to light-gage steel framing members not less than 0.0179 inch thick, provide steel screws complying with ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
4. For attachment to wood framing members, provide steel screws complying with ASTM Standard C1002.

Q. Sealants: Furnished and installed as part of Work within Section 07 90 00 - Joint Protection.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Substrates: Contractor shall verify the substrates and surfaces to receive the EIFS system are structurally sound, clean, dry and free of warpage, residual moisture or damage from moisture. Surfaces shall be uniform, flat with no irregularities greater than 1/8" in a 4'-0" radius. Surfaces shall be inspected for compliance with the following requirements prior to installation of the EIFS system.
1. Concrete, Masonry, or Plaster: Where required; existing brick masonry Surfaces shall be properly cured and free of dirt, dust, oil, grease, mildew, fungus, laitance, efflorescence and any other contaminant. Any surfaces not in compliance shall be corrected by the General Contractor prior to installation of the EIFS system.
 - a. Concrete form release agents and other surface contaminants shall be removed by wire brush, sandblasting, waterblasting or other appropriate means.
 - b. Efflorescence may be removed by a diluted acid wash and rinse, or other appropriate means.
 - c. Dry, porous surfaces of concrete, masonry or plaster, shall be treated with surface conditioner.
 - d. Painted surfaces shall be removed by wire brushing, sandblasting, waterblasting or other appropriate means.
 - e. If leveling of irregularities is required, level with appropriate leveling material to thickness required to achieve a smooth, plumb surface.
 2. Wood Sheathing: Where required by Drawings and/or field conditions; plywood or other wood sheathing shall meet APA - The Engineered Wood Association (formerly American Plywood Association) requirements for Exterior or Exposure I classification. APA design and construction guidelines shall be followed for storage, handling, and installation.
 3. Gypsum Board Sheathing: Exterior gypsum board sheathing shall meet requirements of ASTM Standards as specified in Section 09 29 00, and shall be handled, installed and protected in accordance with Gypsum Association (GA) standards and manufacturer's requirements.
- B. Discrepancies: After inspection of surfaces, written notification of any discrepancies, and correction by the General Contractor of any deviations from specification requirements, the installation of the EIFS system may begin.

- C. Storage, Handling, Installation and Protection: Manufacturer's published recommendations shall be followed for storage, handling, installation and protection. Any sheathing not in compliance shall be replaced to conform with specification requirements prior to installation of the EIFS system.

3.02 INSTALLATION

- A. Applicator: All Work shall be performed by manufacturer trained applicators.
- B. Application: Comply with system manufacturer's current published instructions for installation, as applicable to each type of substrate indicated.
- C. Impact Resistant EIFS: Provide reinforced application where noted on the Drawings to provide additional impact resistance. At such areas, use Panzer® 20 Mesh Base Coat System installed in accordance with manufacturer's specifications.
- D. Trim Accessories: Provide all required trim Work as required by Drawings and/or field conditions.

3.03 MIXING

- A. Containers, Mixers, and Tools: Use clean containers, free of all foreign substance, for mixing and preparing material. Do not use containers which have been used for or cleaned with a petroleum product. Clean tools immediately with water.
- B. Adhesive Preparation:
 - 1. Stir Adhesive before adding Portland Cement to assure homogenous material.
 - 2. Mix products as required by Manufacturer's Application Instructions. Use immediately after tempering.

3.04 APPLICATION

- A. Air/Weather Barrier:
 - 1. Grid Tape: For sheathing substrates, apply the grid tape along all joints in the sheathing, as well as; inside corners, outside corners, and exposed edges at terminations that will not be covered with flashing tape. Center the grid tape on the sheathing joints, edges, etc. with the pressure sensitive backing in contact with the sheathing surface. Press into position with hand pressure until adhesive is achieved. Apply only enough grid tape as can be covered with backstop material in the same Work period. For concrete and masonry substrates, grid tape is not necessary.
 - 2. Backstop: Mix the backstop material with Portland Cement in accordance with manufacturer published instructions for installation. Use a stainless steel trowel to apply a base layer of backstop mixture over all sheathing joints, inside corners, outside corners, and all other areas that have grid tape applied. Smooth and feather the backstop mixture to completely cover the grid tape and allow to take up for a minimum of two (2) hours. Apply a layer of backstop mixture over the entire wall surface to a uniform thickness of approximately 1.6 mm (1/16 in.) and allow to completely dry.
 - 3. Flashing Tape: Flashing tape must be installed in order to maintain a continuous air and weather barrier from the backstop mixture onto the framing edges at openings, across expansion joints, and at changes in substrate material, as shown in the Manufacturer's System Installation Details.

- a. Surface Preparation: Apply only in fair weather when air and surface temperatures are above 4°C (40°F). The surface to receive the flashing tape must be clean, dry, smooth, free of protrusions and any other condition that will hinder adhesion. Clean loose dust or dirt from the surface by wiping with a clean, dry cloth or brush. If good initial adhesion cannot be obtained because of surface dust, cold temperature, or other conditions, priming is recommended with flashing tape surface conditioner.
 4. Flashing Tape Surface Conditioner: Field-mix with clean, potable water. Apply to the surfaces, which are to receive the flashing tape. Conditioning should be limited to areas that can be covered with flashing tape within the same Work period.
- B. Insulation Board:
1. Insulation board shall be applied to all areas indicated to receive EIFS system. Unless otherwise noted, insulation board shall be applied to exterior gypsum board and plywood sheathing and/or other acceptable substrates as indicated on the Drawings.
 2. At vertical surfaces, begin the application of insulation board at the base, from firm, permanent or temporary support. Adhesion shall be made to a clean hard surface. Board shall be applied horizontally in a running bond pattern with joints offset to substrate joints.
 3. Precut insulation board as required to fit continuous reveals, openings, and projections. Vertical joints shall be staggered, and insulation boards interlocked at corners.
 4. Adhesive mixture shall be troweled onto the back of insulation board with a notched trowel to produce a continuous coat, when the substrate is gypsum. The "Ribbon and Dab" method may be used with all other substrates, except wood base sheathing. Apply 2" wide by 3/8" thick ribbons and 8 dabs 4" diameter in the field of each 2 x 4 board, placed 8" to 12" on center and around perimeter of board. Ambient temperature shall be not less than 45°F at time of application, and rising, for not less than forty-eight (48) hours.
 5. Apply pressure over entire surface of board to insure uniform contact and high initial grab. Abut all joints tightly and insure an overall flush level surface. After insulation boards are firmly adhered to the substrate, fill any open joints in the insulation board with sliver of insulation or approved spray foam and rasp flush the entire insulation board surface to achieve a smooth, even surface and remove any ultraviolet ray damage.
- C. Base Coat System: For Standard Mesh, Standard Plus Mesh, or Intermediate Mesh.
1. Using a stainless steel trowel, adhesive mixture shall be applied to the surface of insulation to a uniform thickness of approximately 1/16".
 2. Mesh shall be immediately embedded into wet adhesive mixture with concave surface to the wall to reduce tendency to curl. The surface shall then be smoothed with a trowel, working from the center toward the edges, until the bare mesh is fully covered and not visible. The final approximate thickness of the base coat shall be sufficient to fully embed the mesh but shall not exceed 3/32". A slight mesh pattern may be visible upon drying.
 3. The mesh shall be lapped a minimum of 2-1/2" on all sides.
 4. A minimum of twenty-four (24) hours shall be allowed for the base coat to cure and shall be protected from damage and weather while curing.
 5. All insulation edges at openings, penetrations, or other termination points shall be backwrapped.

D. Double Mesh Base Coat System:

1. Double layers of Standard Plus Mesh may be used for local reinforcing only. The first mesh layer shall be installed as previously specified.
2. The surface of the first mesh layer shall be examined after curing for projections, loose strands, and corrected to produce a flat face.
3. The second mesh layer shall be applied in the same manner as the first layer. The lapped edges of the mesh in the two layers shall be offset.

E. Panzer® 20 Mesh Base Coat System:

1. Sufficient adhesive mixture shall be applied to the face of the insulation to a uniform thickness, not to exceed 1/8".
2. The Panzer® 20 Mesh shall be immediately embedded into the wet adhesive mixture, working from the center toward the edges. The surface shall then be smoothed until the mesh is fully covered and not visible. The approximate thickness of the base coat shall not be excessive, but sufficient to fully cover the mesh. Edge of adjacent Panzer® 20 Mesh pieces shall be tightly butted, not lapped.
3. A minimum of twenty-four (24) hours shall be allowed for base coat to cure and shall be protected from damage and weather while curing.
4. The surface of the Panzer® 20 Mesh layer shall be examined after curing for projections, loose strands, and corrected to produce a flat surface.
5. A second layer consisting of adhesive mixture and Standard Mesh or Standard Plus Mesh shall be applied over the Panzer® 20 Mesh layer as previously specified.

F. Finish Applications:

1. General:

- a. After stirring to a homogeneous consistency, apply finish to the entire wall surface in a continuous application.
- b. Finish shall be trowel or spray-applied per manufacturer's application instructions.
- c. Protect finish from airborne contamination such as dust, soot, weather, and other damage until fully dried.
- d. Additives are prohibited.

2. Sandblast® DPR Finishes:

- a. Finish coat shall be applied tight to the base coat. When trowel-applied, leveling and texturing shall take place in one operation.
- b. Sandblast® finish thickness shall be approximately 1 to 1-1/2 times the thickness of the largest aggregate.

3.05 JOINTS

A. Control Joints:

1. Provide control joints at locations indicated, and elsewhere where directed by the Architect. Consult with Architect prior to installation of joints.
2. Construct a continuous open joint full depth of EIFS system, width as indicated and as required by field conditions. Apply reinforcing fabric wrapping edge and return on back side of insulation.
3. Finish joint to match adjacent surfaces.

B. Expansion Joints: Provide expansion joints at the following locations, and as indicated on Drawings, and as required by field conditions.

1. Where expansion joints exist in substrate.
2. Where building expansion joints occur.
3. Where substrate material changes.
4. Where significant structural movement occurs.

C. Joints Between Dissimilar Materials: Provide not less than a 3/4" joint at abutment of dissimilar materials and the EIFS system.

3.06 AESTHETIC GROOVES AND REVEALS

- A. Provide aesthetic grooves and reveals at locations indicated on Drawings, and as directed by Architect. Consult with Architect prior to installation of aesthetic details.
- B. Construct joint by tooled method, maintaining minimum insulation board thickness as specified herein. Finish joint to match adjacent surfaces.

3.07 CLEANING AND PROTECTING

- A. Remove temporary covering and protection of other Work. Promptly remove protection from window and door frames.
- B. Provide final protection and maintain conditions in a manner suitable to installer and system manufacturer, which ensures exterior insulation and finish system without damage or deterioration at time of substantial completion. If damage occurs, whoever is responsible for damaged area shall restore to a condition indistinguishable in appearance from, and equivalent in performance to, undamaged areas by replacing or repairing in compliance with system manufacturer's recommendations.
- C. All Work adjacent to operations shall be inspected for damage resulting from installation of the EIFS system and repaired or cleaned prior to completion of Work.

3.08 CLEAN-UP

- A. Clean all EIFS system materials from adjacent finished surfaces as the Work progresses. Contractor shall be responsible for, and pay all costs incurred for repairing or replacing adjacent finish materials that cannot be cleaned to the original condition, at no cost to the Owner.
- B. During progress of Work, upon completion of Work, and before final acceptance of Work, keep the premises reasonably free of debris and waste materials resulting from the Work. Remove construction debris and rubbish from the site, and legally dispose. Upon completion and before final acceptance of the Work, remove all unused materials, tools, and equipment from the site.

END OF SECTION

SECTION 07 53 23FULLY ADHERED ROOFING SYSTEM

The requirements of the "General Conditions", the "Supplementary Conditions", and "Division 1" sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Furnish all labor, material, tools, equipment, transportation, protection, supervision, and services as necessary for the proper execution and installation of EPDM Fully - Adhered Roofing System in strict accordance with Drawings and Specifications approved by the roofing manufacturer. Work includes, but is not necessarily limited to providing the following:
1. Roofing for new construction.
 2. Flashings and insulation as specified herein and as indicated on the Drawings in accordance with the manufacturer's most current specifications and details.
 3. Cutting roof membrane, insulation, and roof deck as required for drains, vents, pipes, ducts, structural support openings, and similar construction as indicated on the Drawings and/or required by field conditions.
 4. Signs and all necessary protection such as, but not limited to barricades around openings in the roof. Erect and maintain barriers to the satisfaction of the Owner's Representative.
 5. Removal and legal disposal off-site of all debris resulting from Roofing Work.
 6. Installation of roof specialties products and accessories.
- B. Related Sections:
1. Metal Work is not warranted by the Roofing System Manufacturer unless it is designated as part of the total Roofing System.
 2. Structural Precast Concrete - Section 03 41 13.
 3. Masonry Work - Section 04 20 00.
 4. Rough Carpentry - Section 06 10 00.
 5. Sheet Metal Work - Section 07 60 00.
 6. Furnishing of Roof and Wall Specialties and Accessories - Section 07 70 00.
 7. Furnishing of Prefabricated Roof Curbs - Division 23.
 8. Furnishing and installing Mechanical Equipment - Division 23.

1.02 QUALITY ASSURANCE

- A. Roofing Contractor: Roofing system shall be installed by a Roofing Contractor authorized by the roofing manufacturer, in compliance with Shop Drawings and Specifications approved by the roofing manufacturer.
- B. Certification: Approved by Underwriters Laboratories Inc. (UL), as a Class A roofing system. Roof system shall meet the requirements of the Owner's Insurance Underwriter.
- C. Inspection: Upon completion of the installation, an inspection shall be made by a Technical Representative of the roofing manufacturer to ascertain the roofing system has been installed according to applicable published specifications and details.
- D. Deviations: There shall be no deviation from this Specification and the manufacturer's approved Specifications and Shop Drawings without prior written approval by the manufacturer.
- E. Final Inspection: A final inspection of the completed roof(s) shall be scheduled and conducted with the Owner's Representative and a Field Service Representative of the manufacturer. The inspection shall be completed prior to final payment to the Roofing Contractor.

1.03 SUBMITTALS

- A. General: Submit Shop Drawings, Product Data, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Shop Drawings: Shop Drawings shall be submitted to the roofing manufacturer by the Authorized Roofing Applicator, along with a completely executed Notice of Award, for approval. Shop Drawings shall be approved and assigned a number by the roofing manufacturer, Technical Services Section.
 - 1. Shop Drawings shall include outline of each roof and size, dimensions of all areas, deck type, roof slope and direction, location and type of penetrations, membrane perimeter and penetration details, insulation manufacturer including brand and thickness, fasteners, special details and Bill of Material.
 - 2. Provide parapet/curb details as required by the Drawings and field conditions.
- C. As-Built Shop Drawings and Notice of Completion: Approved Applicators shall supply Carlisle SynTec Incorporated with As-Built Shop Drawings and Notice of Completion for final approval.

1.04 PRE-ROOFING CONFERENCE

- A. Preliminary Roofing Conference: As soon as possible after award of Roofing Work, meet with Installer (Roofer), installers of substrate construction such as decks, and other Work adjoining roof system including penetrating Work and rooftop units, Architect, the Owner, and representatives of other entities directly concerned with roofing system performance, including Owner's insurers and test agencies.
 - 1. Review Contract Documents, submittals, status of coordinating Work, availability of materials, installation facilities, and establish preliminary installation schedule. Review requirements for inspections, tests, certifications, forecasted weather conditions, governing regulations, insurance requirements, and proposed installation procedures.
 - 2. Discuss roofing system protection requirements for construction period extending beyond roofing installation. Discuss possible need for temporary roofing.

3. Record discussion, including agreement or disagreement on matters of significance; furnish copy of recorded discussions to each participant. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.
- B. Preapplication Roofing Conference: Approximately two (2) weeks prior to scheduled commencement of roofing installation and associated Work, meet at Project site with Installer, installer of each component of associated Work, installers of deck or substrate construction to receive Roofing Work, installers of rooftop units and other Work in and around roofing that must precede or follow Roofing Work, Architect, the Owner, roofing system manufacturer's representative, and other representatives directly concerned with Work performance, including Owner's insurers, test agencies, and governing authorities, where applicable.
1. Review foreseeable methods and procedures related to Roofing Work, including, but not necessarily limited to the following:
 - a. Tour representative areas of roofing substrates (decks) inspect and discuss condition of substrate, roof drainage, curbs, penetrations, and preparatory Work performed by other trades.
 - b. Review structural loading limitations of structural precast concrete deck, and inspect for loss of flatness and for required mechanical fastening.
 - c. Review roofing system requirements, including Drawings, Specifications, and other Contract Documents.
 - d. Review required submittals, both complete and incomplete.
 - e. Review and finalize construction schedule related to Roofing Work and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - f. Review required inspection, testing, certifying, and material use accounting procedures.
 - g. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing, if it is not a mandatory requirement.
 2. Record Contractor discussions of conference, including decisions and agreements or disagreements reached, and furnish a copy to each attendee. If substantial disagreements exist at the conclusion of the conference, determine how disagreements will be resolved and set a date for reconvening the conference.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliveries: Deliver materials to the Project site in manufacturer's original unopened tightly - sealed containers and/or wrappings with manufacturer's name, product brand names, and installation instructions intact and legible. Deliver in sufficient quantity to permit Work to continue without interruption.
- B. Material Storage: Comply with the manufacturer's written instructions for proper material storage.
1. Store materials, except membrane, between 60°F and 80°F, in dry areas protected from water and direct sunlight. If exposed to lower temperature, restore to proper temperature before using.
 2. Store materials containing solvents in dry, well ventilated spaces with proper fire and safety precautions. Keep lids on tight.

- C. Material Shelf Life: Do not retain material at the jobsite which has exceeded the shelf life recommended by the manufacturer.
- D. Insulation: Store insulation so that it is kept dry and is protected from the elements. Store insulation on pallets, off the ground and completely covered tightly with breathable waterproof materials such as tarp or canvas.
- E. Damaged Materials: Any materials which are found to be damaged shall be removed and replaced at the applicator's expense.

1.06 PROJECT CONDITIONS

- A. Do not use bitumen base roof cement.
- B. Do not install EPDM membrane directly onto low melting point asphalt (ASTM Standard D312, Type I & II).
- C. Do not allow waste products (petroleum, grease, oil, solvents, vegetable or mineral oil, animal fat) direct steam venting to come in contact with EPDM Roofing System.
- D. Do not expose membrane or flashing to constant temperatures in excess of 180°F.
- E. Cements and bonding adhesives are flammable. Do not breathe vapors or use near fire.
- F. Cleaners used in the splicing procedure are extremely flammable; do not use near fire or flame, or a confined or unventilated area. Dispense only from a UL Listed or FM Approved container.
- G. Splicing and bonding surfaces shall be dry and clean.
- H. Cold temperatures will not restrict installation of the Roofing System. Follow specified precautions for storage of materials and expose only enough cement and adhesive to be used within a four (4) hour period.
- I. Roof surface shall be free of ponded water, ice, or snow to eliminate future condensation problems.
- J. Vapor Retarder: The specified manufacturer does not require a vapor retarder for the protection of the membrane. However, to protect the insulation and reduce moisture absorption within the roofing assembly, vapor retarders should be used when the following conditions are anticipated.
 - 1. The outside, average January temperature is below 40°F.
 - 2. The expected winter, interior, relative humidity is 45% (or greater) at 68°F.

1.07 WARRANTY

- A. A roofing manufacturer Technical Representative shall inspect the installation of the Membrane Roofing System to verify compliance with approved Shop Drawings and Specifications and upon approval, issue not less than a fifteen (15) year warranty.
- B. Furnish not less than a fifteen (15) year Membrane System Warranty for membrane, flashing, adhesive, sealant, and other brand name products utilized in the Work.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Roofing System: Components shall be Sure-Seal® products of Carlisle SynTec Incorporated, P.O. Box 7000, Carlisle, PA 17013, (800)479-6832; www.carlisle-syntec.com, or accepted and certified by Carlisle SynTec Incorporated as compatible.
- B. Comparable Manufacturers: The following manufacturers may be acceptable subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.
 - 1. Firestone Building Products, 250 West 96th Street, Indianapolis, IN 46260, (800)428-4442 or (317)575-7000; www.firestonebpco.com.
 - 2. GenFlex Roofing Systems, 250 West 96th Street, Indianapolis, IN 46260, (800)443-4272; www.genflex.com.
 - 3. Johns Manville Roofing Systems, P.O. Box 5108, Denver, CO 80217-5108, (800)654-3103 or (303)978-2000; www.jm.com.

2.02 MEMBRANE

- A. Sure-Seal® (Black) .060 inch thick (60-mil), non-reinforced, EPDM (Ethylene, Propylene Diene Terpolymer) based elastomeric homogenous roof covering conforming to the following minimum physical properties:

<u>Physical Property</u>	<u>Test Method</u>	<u>ASTM Spec. (Pass.)</u>	<u>Typical</u>
Tolerance on Nominal Thickness, %	ASTM D412	± 10	± 10
Tensile Strength, min., psi	ASTM D412	1305	1550
Elongation, Ultimate, min., %	ASTM D412	300	480
Tear Resistance, min., lbf/in	ASTM D624	150	200
Factory Seam Strength, min.	ASTM D816 Modified	Membrane Rupture	Membrane Rupture
Resistance to Heat Aging*	ASTM D573		
Properties after 4 weeks @ 240°F			
Tensile Strength, min., psi	ASTM D412	1205	1500
Elongation, Ultimate, min., %	ASTM D412	200	225
Tear Resistance, min., lbf/in	ASTM D624	125	215
Linear Dimensional Change, max., %	ASTM D1204	± 1.0	-0.4
Ozone Resistance*	ASTM D1149	No Cracks	No Cracks
Condition after exposure to 100 pphm Ozone in air for 168 hours @ 104°F. Specimen is as 50% strain			
Brittleness Temp., max., degrees F.	ASTM D746	- 49	-67
Resistance to Water Absorption *	ASTM D471	+8, -2	+2.0
After 7 days immersion @ 158°F			
Change in mass, max. %			
Water Vapor Permeance*	ASTM E96	0.10	0.05
max, perms	(Proc. B or BW)		
Resistance to Outdoor (Ultraviolet) Weathering*	ASTM D4637	No Cracks	No Cracks
Xenon-Arc, 7560 kJ/m ² total radiant exposure at 0.70 W/m ² irradiance, 176°F black panel temperature		No Cracking	No Cracking

* Not a Quality Control Test due to the time required for the test or the complexity of the test. However, all tests are run on a statistical basis to insure overall long-term performance of the sheeting.

2.03 RELATED MATERIALS

- A. General: The following materials shall be provided by the membrane manufacturer.

1. Flashing: Uncured EPDM .060 inch thick.
2. Air and Vapor Barrier: VapAir Seal 725TR.
3. Insulation Adhesive: Flexible Fast Adhesive.
4. Bonding Adhesive: Synthetic rubber adhesive.

5. Splice Tape: 3" or 7" wide EPDM based.
 6. Primer: Solvent based.
 7. Splicing Cement: Solvent based contact cement.
 8. Splice Cleaner: Solvent based cleaner.
 9. Lap Sealant: Trowel or gun consistency.
 10. Water Cut-Off Mastic: Low viscosity, self-wetting, butyl blend mastic.
 11. Molded Pipe Flashing: Cured precast base flashing.
 12. Sealer: Pourable, two-component, solvent free, polyurethane based sealant.
 13. Rubber Fastening Strip and Universal Fasteners: Extruded fastener bars and fasteners.
- B. Insulation: Polyisocyanurate with a medium glass facer supplied or approved by the roofing manufacturer and approved by Underwriters Laboratories Inc. (UL) for use within Class A roofing system. Insulation shall have a compressive strength of not less than 25 psi.
1. Insulations Supplied by Others: Insulation products supplied by others are expressly disclaimed by the specified roofing system manufacturer's Warranty. Certain insulations are either chemically or physically incompatible with the specified manufacturer's roofing system. Therefore, insulations manufactured by others may be used only when the respective manufacturer has published a recommendation for their product's successful performance as part of the applicable roofing system and the roof system manufacturer accepts the use of the insulation as a compatible surface to which the roofing system may be applied.
 2. R-Value: Two (2) layer system shall attain an R-value of not less than R-15 unless otherwise noted on the Drawings.
- C. Insulation Saddles: Drawings indicate general layout, not actual location. Design saddles to drain properly, including valleys, with a minimum slope of 1/4" per 12", unless otherwise specified on the Drawings.
- D. Wood Nailers: All wood nailers shall be pressure treated with preservatives as specified in Section 06 10 00 - Rough Carpentry.
- E. Protective Membrane Sheets: Molded rubber, 30" by 30", provided by the membrane manufacturer.
- F. Roof Walkway Pads: Individual Sure-Seal® molded compressed rubber walkway pads with slip resistant surface and factory rounded corners, 30" by 30", approximately 5/16 inch in thickness, provided by the membrane manufacturer.

PART 3 - EXECUTION

3.01 SUBSTRATE INSPECTION

- A. General Contractor shall provide proper substrate to receive the EPDM Roofing System. Roofing subcontractor shall notify the General Contractor in writing of defects in the substrate, and Work shall not proceed until defects have been corrected.

3.02 INSTALLATION

A. Air and Vapor Installations:

1. Surface Preparation: Concrete shall be in place for 7 days minimum and the substrate must be dry. The surface shall have a smooth finish and be free of voids, spalled areas, sharp protrusions, loose aggregate, laitance and form release agents. In the event of rain, concrete must be allowed to dry before primer is applied.
2. Primer: Surfaces to receive Air and Vapor Barrier must be clean and dry. Apply Primer to surface by spray, brush or with a long nap roller at the applicable coverage rate noted above. At 75°F allow primer to dry 1 hour minimum. Primer has a satisfactory cure when it will not transfer when touched. Prime only areas to be waterproofed the same day. Re-prime if area becomes dirty.
3. Application: Apply Air and Vapor Barrier from low to high point, in a shingle fashion, so that laps will shed water. Overlap all edges at least 2-1/2". End laps shall be staggered. Place membrane carefully so as to avoid wrinkles and fishmouths. Immediately after installation, roll with 30" wide 150 pound weighted segmented steel roller.
4. Insulation Installation: Ensure surface of Air and Vapor Barrier is dry prior to installing insulation. Place insulation over the surface and adhere to the vapor barrier in accordance with this Carlisle Specification.

B. Insulation Attachment:

1. Insulation shall be adhered to the Air and Vapor Barrier with Flexible FAST adhesive as recommended by the manufacturer as specified herein.
2. Apply insulation boards with long joints either parallel or at the right angles to the ribs of the deck. Joints parallel to ribs shall be formed over solid bearing with all end joints staggered. Boards shall be butted together with no gap width greater than 1/4 inch or less.
3. Stagger the insulation board joints by the maximum distance possible.
4. Where indicated on the Drawings install drainage saddles on final layer of insulation.

C. Membrane Placement and Attachment:

1. Sweep all loose debris from the substrate and position EPDM Roofing Membrane over approved substrate without stretching.
2. Allow membrane to relax approximately 30 minutes prior to bonding, splicing, and flashing.
3. Fold the EPDM membrane sheet back 5 feet so half of the sheet underside is exposed. Sheet fold must be smooth without wrinkles or buckles.
4. Stir bonding adhesive thoroughly, scraping the sides and the bottom of the can (minimum 5 minutes stirring is recommended). Bonding surfaces must be dry and clean.
5. Apply bonding adhesive evenly, without globs or puddles, with a plastic core medium nap paint roller. A 9 inch roller will easily fit into the 5 gallon container.
6. Apply bonding adhesive to the membrane sheet and the substrate to achieve continuous coating of both surfaces at a coverage rate of approximately 120 square feet per gallon per one surface (membrane or substrate) or approximately 60 square feet per gallon per finished surface (includes coverage on both membrane and substrate).

7. A mechanical roller dispenser or a mechanical sprayer can be used to apply bonding adhesive when the continuous coating coverage rates noted above are maintained. If a mechanical sprayer is used to apply bonding adhesive, the adhesive must be rolled after spraying with a plastic core medium nap paint roller to provide 100% coverage.
8. Allow adhesive to dry until tacky, but not string or stick to a dry finger touch.
9. Roll the coated membrane into the coated substrate while avoiding wrinkles.
10. Brush down the bonded half of the membrane sheet, immediately after rolling the membrane sheet into the adhesive, with a soft bristle push broom to achieve maximum contact.
11. Fold back the unbonded half of the membrane sheet and repeat the bonding procedure.
12. Install adjoining membrane sheets in the same manner, overlapping edges approximately 4 inches to achieve a minimum 3 inch splice. All splices shall be shingled to avoid bucking of water.

D. Splicing:

1. Membrane overlap splices must be a minimum of 3 inches wide. Field splices at roof drains must be located outside the drain sump.
2. Clean the dry splice area of both membrane sheets by scrubbing with Sure-Seal® HP Splice Wipes or clean natural fiber rags saturated with Sure-Seal® Splice Cleaner. Extra cleaning is required along a factory seam which intersects a splice area. Sponges, sponge mops, squeegees, brushes, paint rollers, etc., must not be used.
 - a. Sure-Seal® Splice Cleaner must be used in conjunction with Sure-Seal® (black) EPDM membrane.
 - b. Sure-Seal® Splice Cleaner must be dispensed from an OSHA approved safety can. Use of the safety can will minimize escaping fumes and will also avoid possible contamination of the Splice Cleaner which can result from immersing a used HP Splice Wipe or cleaning rag into an open can.
3. Check the membrane surfaces to verify adequate cleaning procedures are maintained.
 - a. Both sides of Sure-Seal® EPDM membrane shall be solid black with no streaking.
 - b. Underside of the overlapping membrane sheet shall be thoroughly cleaned.
4. Hold the top membrane sheet back as the cleaning and scrubbing process continues along the length of the splice so that both mating surfaces may be cleaned at approximately the same time.
5. Stir Splicing Cement thoroughly scraping the sides and the bottom of the can (minimum 5 minutes stirring is recommended).
 - a. Sure-Seal® EP-95 Splicing Cement shall be used with Sure-Seal® (black) EPDM membrane. Properly stirred splicing cement will have a solid black appearance with no heavier material on bottom or sides of can.
 - b. Membrane surfaces must be visibly dry and clean as stated above.

6. Apply Splicing Cement to both mating surfaces using a 4 inch wide, 1/2 inch medium nap roller provided in each carton of Splicing Cement. Apply cement smoothly, continuously and relatively even to achieve a heavy coat.
 - a. Do not allow the cement to glob or puddle.
 - b. When a roller cannot be effectively used (at angle changes, corners, etc.), a 1/2 inch thick paint brush may be used to apply Splicing Cement; however, the Splicing Cement must be applied to achieve a smooth surface without brush marks.
 - c. When temperatures are expected to fall below 40 degrees Fahrenheit, the use of a paint brush must be limited since brush marks will not bleed out.
 - d. Approximately 120 linear feet of coverage per gallon can be achieved for a 3 inch wide membrane splice (when the coated surface is approximately 4 inches wide on both mating surfaces).
7. Allow the cement to dry until tacky but not string or stick to a dry finger touch and will not move when pushed with a dry finger.
8. Do not allow the Splicing Cement to over-dry before mating the two surfaces. Over-dried Splicing Cement will not be tacky.
9. For Cured-to-Cured Membrane Splices Only:
 - a. Just prior to closing the splice, apply a bead of In-Seam Sealant™ approximately 5/32 inch in diameter (no less than 1/8 inch and no more than 1/4 inch wide) a minimum of 1/2 inch from the inside edge of the bottom membrane sheet and a minimum of 2 inches from the lead edge. Do not allow sealant to dry.
 - b. Maintain a continuous bead of In-Seam Sealant™ on all membrane splices.
 - c. During splice cleaning procedures, Sure-Seal® HP Splice Wipes contaminated with In-Seam Sealant cannot be reused for the application of Splice Cleaner.
 - d. Roll the top membrane sheet onto the mating surface. Take care not to stretch or wrinkle the membrane sheet to avoid a fishmouth in the field splice.
 - e. Assemble the seam with hand pressure by wiping toward the splice edge.
 - f. Immediately roll the splice with a 2 inch wide steel roller, using positive pressure, toward the outer edge of the splice. DO NOT ROLL PARALLEL TO THE SPLICE EDGE. On a completed splice, the In-Seam Sealant must remain evident and be sensitive to the touch.
10. For cured-to-cured membrane splices, wait at least two (2) hours after the completion of the splice before applying Lap Sealant. If weather is threatening, Lap Sealant may be applied without waiting; however, the splice area must be checked the following day for fishmouths or evidence of solvent entrapment (bubbled Lap Sealant).
 - a. Check the splice edge for dust, dirt or other contaminants.
 - b. Clean the dry splice edge, extending at least 1 inch onto the top and bottom membranes, using Sure-Seal® HP Splice Wipes or a clean cloth dampened with Splice Cleaner and apply a 5/16 inch (minimum 1/4 inch) diameter bead of Lap Sealant to completely cover the splice edge.

- c. Sure-Seal® Splice Cleaner and Lap Sealant must be used with Sure-Seal (black) EPDM membrane.
 - d. Feather the Lap Sealant with the specially preformed tool (included in the Lap Sealant cartons) so the high point or the crown of the Lap Sealant is located over the edge of the splice.
 - e. Clean the specially preformed tool occasionally for consistent crowning of the Lap Sealant.
 - f. Application of Lap Sealant must be completed by the end of the day. Lap sealant may be applied immediately upon completion of uncured to cured or uncured to uncured splices.
- E. Flashing: Perimeter flashing and flashing of roof penetrations shall be done with .060 inch thick uncured Elastoform Flashing and pre-fabricated flashing accessories. All flashing shall be done in accordance with the roofing manufacturer's Standard Details.
- F. Daily Seal: Ensure that water does not flow beneath completed sections of membrane system by completing flashings, terminations, and daily seals by the end of each work day. Temporarily seal loose edge of membrane with Sure-Seal® Pourable Sealer when weather is threatening.
- 1. Mix the two components thoroughly according to the instructions on the label.
 - 2. Apply Pourable Sealer at a rate of 100 lineal feet per gallon, 12 inches back from edge of sheet onto exposed substrate surface. If necessary, use a trowel to spread material in order to achieve complete seal.
 - 3. After embedding membrane in Pourable Sealer, check for continuous contact, then weight the edge, providing continuous pressure over the length of the cutoff. The recommended weight is a ten (10) foot length of 2-1/2 inch Sure-Seal Lay Flat Tubing filled with dry sand.
 - 4. When Work is resumed, pull membrane free; trim and remove membrane where sealer was previously applied before continuing installation of adjoining sections.

3.03 ROOF SPECIALTIES AND ACCESSORIES

- A. Installation: Receive from the Roof Specialties and Accessories Contractor, items and materials specified herein, and install where indicated on Drawings, and/or required by field conditions.
- 1. Walkway Roof Pads: Install prefabricated pads as indicated and/or noted on the Drawings, in accordance with the roofing manufacturer's specifications.
 - 2. Pipe Supports: Install pipe supports over protective membrane sheets as indicated on the Drawings, in accordance with roofing manufacturer's instructions and specifications.
 - 3. Roof Hatch(es): Install factory-assembled roof hatch unit(s) with sealants, anchoring devices, and miscellaneous accessories, in accordance with the manufacturer's recommendations. Unless otherwise noted on the Drawings, install roof hatch(es) level, providing shimming accessories compatible with roof construction.
 - 4. Prefabricated Roof Curbs: Receive prefabricated roof curbs from Roof Specialties and Accessories Contractor, set in place, fasten to roof deck, and flash to substrate in accordance with approved Shop Drawings.
- B. Roof Walkway Pads: Coordinate with Mechanical and Electrical Contractors for installation of prefabricated pads as specified herein and indicated on the Drawings, adhered to the EPDM membrane with Sure-Seal® Splicing Cement in accordance with the roofing manufacturer's specifications.

- C. Prefabricated Roof Curbs: Receive prefabricated roof curbs from Mechanical Contractor, set in place, fasten to roof deck, and flash to substrate in accordance with approved Shop Drawings.

3.04 CLEAN-UP

- A. Work Required: Clean-up any Work soiled in the performance of roofing Work.
- B. Debris and Waste Material: During progress of the Work, upon completion of Work, and before final acceptance of the Work, keep the premises free of debris and waste material resulting from Work of this section. Remove all debris and rubbish to central area designated by the General Contractor, for general clean-up by the General Contractor, or if directed by the General Contractor to remove from the site and legally dispose.
- C. Unused Material, Tools, and Equipment: Upon completion of Work and before final acceptance of the Work, remove all unused materials, tools, and equipment from the site.

END OF SECTION

SECTION 07 60 00SHEET METAL WORK

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials and equipment and services necessary to furnish and install Sheet Metal Work as indicated on Drawings and specified herein. The Work includes, but is not limited to the following:
 - 1. Roofers Sheet Metal and Miscellaneous Sheet Metal Work.
 - 2. Prefinished Galvanized Metal Gutters and Downspouts.
- B. Color Selections: Refer to the Drawings.
- C. Related Sections: The following Work will be provided under other sections of the Specifications, as indicated:
 - 1. Miscellaneous Metal Work - Section 05 50 00.
 - 2. Wood Blocking, Nailers, Plywood, Building Wrap, Etc. - Section 06 10 00.
 - 3. Thermal Insulation - Section 07 21 00.
 - 4. Fiber-Cement Siding and Trim Materials - Section 07 46 46.
 - 5. Exterior Field Painting - Section 09 91 13.

1.02 APPLICABLE STANDARDS - SHEET METAL WORK

- A. General: All Work and materials as shown on the Drawings and specified herein shall conform with the requirements of the Architectural Sheet Metal Manual, Fifth Edition, published in 1993, hereinafter referred to as “SMACNA Manual”, as issued by the Sheet Metal and Air Conditioning Contractors’ National Association.
- B. Standards: All sheet metal and associated building materials and systems shall meet local building code requirements for fire spread, uplift resistance, and wind loads.

1.03 QUALIFICATIONS OF SHEET METAL CONTRACTOR

- A. Sheet Metal Contractor shall be a qualified Contracting Firm, with a minimum of five (5) years experience, capable of following the Specifications, and willing to accept instructions in the field.

1.04 WORKMANSHIP

- A. Work shall be performed by skilled tradesmen.
- B. Comply with the Contract Documents and the oral instructions of the Owner’s Representative.

- C. Work not fully indicated by the Contract Documents shall be done in accordance with printed instructions of the system manufacturer, or as directed by the Owner's Representative.
- D. Consult the Specifications of the other Trades which connect to the Work specified herein, to become thoroughly familiar with the extent of the Work provided by others. Any items not specified under the other Trade headings, but required for completion of Work specified herein shall be provided as part of Work within this section.

1.05 SUBMITTALS

- A. General: Submit Shop Drawings, Product Data, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Shop Drawings: Prepare complete detailed Shop Drawings showing all fabricated items and the methods of assembling, jointing, seaming and securing of Sheet Metal Work.
 - 1. Provide complete Shop Drawings and erection drawings for each product named which shall include a material schedule, details, profiles, gauges, dimensions, layout, anchorage and joint details.
- C. Product Data: Submit Product Data for each manufacturer's factory/shop fabricated product specified under Work of this section.
 - 1. Provide complete and fully descriptive manufacturer's technical data and literature for all factory fabricated items naming all materials, dimensions, finishes and accompanying accessory items.
- D. Samples: Submit two (2) 8" square Samples of factory finished sheet material, and two (2) 12" long samples of factory fabricated products.
- E. Installer's Certificate: Upon completion of Sheet Metal Work, submit a written certification to the Architect and Owner, signed by the installer, stating all flashing was furnished and installed in accordance with, or exceeding the requirements of, specifications for ten (10) year type flashing. All flashing shall be designed and installed to obtain a watertight installation.

1.06 MATERIAL DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver only acceptable materials to the site in original boxes, crates, wrappings, properly packaged for protection against damage in transportation, clearly labeled with all pertinent information, to facilitate checking. Upon receipt of materials and components, installer shall examine the shipment for damage and completeness.
- B. Storage: Store and field protect materials at the site off the ground and in properly protected clean and dry storage facilities until ready for use. Stack all materials to prevent damage and to allow for adequate ventilation.
 - 1. Roofing Felt: Rolls shall always be stored upright on pallets.
- C. Handling: Exercise care in unloading, storing and installing all components to prevent bending, warping, twisting, and surface damage. Replace any damaged materials.

1.07 MAINTENANCE CONTRACT

- A. Sheet Metal Contractor shall agree to maintain the Sheet Metal Work in a weathertight and watertight condition for a period of not less than five (5) years from the date of Owner's acceptance.

- B. During the Maintenance Period, Contractor shall inspect and make immediate emergency repairs to defects or leaks in the Sheet Metal Work within twenty-four (24) hours of notice from the Owner's Representative. Within a reasonable time, restore the affected items to the standard of the original specifications. All emergency and permanent Work during the life of the contract to maintain Sheet Metal Work will be done without cost to the Owner, except in the event that leaks were caused by abuse, lightning, hurricane, tornado, hail storm or other unusual climatic phenomena of the elements, or failure of related Work (except related Roof Metal Work included under the Contract) installed by other parties.
- C. Contract agreement to maintain Sheet Metal Work shall be in a written form acceptable to the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Provide all Sheet Metal Work shown on Drawings and specified herein, except for items that are specifically noted on the Drawings or specified to be provided by others.
- B. Galvanized Sheet Metal: Commercial quality, coated bearing sheet steel products of not less than the US standard gauges specified below, unless otherwise noted on the Drawings. Sheet metal shall have a uniform Coating Designation G90 zinc coating applied by the continuous Hot-Dip Process in compliance with ASTM Standard A924 to both sides of the base metal. Each sheet or formed product shall bear the manufacturer's stenciled registered trade name of the product, type of base metal, gauge, and heat number. Materials shall be in compliance with ASTM Standard A653 (formerly ASTM Standard A526) commercial quality and ASTM Standard A653 (formerly ASTM Standard A527) for lock-forming quality sheet metal.
 - 1. Products and Manufacturer: ZINCGRIP® galvanized sheet steel with PAINTGRIP® zinc-phosphate coating such as manufactured by AK Steel Corporation, 9227 Centre Pointe Drive, West Chester, OH, 45069, (513)425-4200 or (800)331-5050; www.aksteel.com. Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.
 - 2. Sheet Metal Products:
 - a. Gutters: 22 gauge (minimum).
 - b. Braces and Brackets: Spacers and hangers shall be minimum 3/16" x 1".
 - c. Downspouts: 26 gauge (minimum).
 - d. Miscellaneous Flashing and Counter Flashing: 24 gauge, or heavier where required to meet service conditions.
- C. Strainers: Provide galvanized wire strainer at downspout locations.
- D. Sheet Lead: 2-1/2# Hard Lead Flashing and 4# Soft Lead Flashing, conforming with Federal Specification QQ-L-201.
- E. Steel Plates and Bar Stock: Conform to ASTM Standard A36 with galvanized finish conforming to ASTM Standard A123.

- F. Pressure Bars: Prefinished 1-1/2" x 1/8" thick galvanized metal with slotted holes, spaced 2" from each end and at 8" O.C., length as required to suit conditions. Secure pressure bars with stainless steel anchor bolts and washers. Provide 1/4" wide gap between lengths of bars.
1. Color: Prefinished pressure bar color shall be as required to match with the exposed contact surface of material the pressure bar is secured to.
- G. Two-Piece Metal Counter Flashing:
1. Manufacturer: Fry Reglet Corporation, 12342 Hawkins Street, Santa Fe Springs, CA 90670, (800)237-9773; www.fryreglet.com.
 2. Product: Provide prefabricated, prefinished two-piece "Springlok® Flashing System", not less than 24 gauge galvanized steel with standard zinc finish. Provide type as required by Drawings, subject to review by the Architect.
 - a. Color: Prefinished flashing color shall be as noted on the Drawings or selected by the Architect.
- H. Building Felt: Type II, No. 30, unperforated asphalt-saturated roofing felt conforming to ASTM D226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- I. Solder: Provide solder for metal alloys in accordance with ASTM B32 - Standard Specification for Solder Metal.
1. For use with Steel: Provide 50 - 50 tin/lead solder, with rosin flux.
 2. For use with Stainless Steel: Provide 60 - 40 tin/lead solder, with acid-chloride type flux, except use rosin flux over tinned surfaces.
- J. Fasteners: #10 x 1-1/4" minimum hex head screws, heavy cadmium plated steel, or stainless steel, and neoprene sealing washers not less than 3/4" O.D.
- K. Sealants:
1. Metal Joint Sealant:
 - a. Manufacturer: Tremco, Incorporated, Commercial Sealants & Waterproofing Division, 3735 Green Road, Beachwood, OH 44122, (800)321-7906 or (216)292-5000; www.tremcosealants.com.
 - b. Product: Provide Mono® 555, one-part Acrylic Terpolymer Sealant, meeting U.S. Federal Specification TT-S-230, or other equivalent product subject to review by the Architect. Color selection shall be by Architect.

2.02 FINISHES

- A. Prefinished Metal Products: Galvanized prefinished metal products shall have a factory-applied, primed, and oven-baked finish based on Kynar 500® Polyvinylidene Fluoride (PVDF) resin by Arkema, Inc., 2000 Market Street, Philadelphia, PA 19103-3222, (800)722-9668; www.arkema-inc.com. Finish shall be a dispersion coating based on a minimum of 70% Kynar 500® resin (of the total binder weight) as formulated by an authorized Arkema Kynar 500® licensee. This finish shall be in strict accordance with the licensed formulator's specification and applied by an applicator approved by the licensed formulator. This finish, based on Kynar 500® resin, shall meet the performance criteria of AAMA 2605 specification and be certified by the formulator as containing Kynar 500® resin manufactured by Arkema. Total overall dry film thickness of the coating system, including primer, shall be not less than 0.9 to 1.1 mil thickness on the exposed finished surface of the metal product.
1. Application: "Kynar 500®" PVDF resin-based coating application method to substrates shall be in accordance with Authorized Licensee's recommended mil thickness, subject to review by the Architect.
 2. Colors: As indicated on the Drawings or selected by the Architect.
- B. Field Painted Metal Products: Where required by Drawings and/or field conditions; Galvanized metal products shall be mill phosphatized (on both sides) after zinc coating and made suitable to receive field painting by others.

PART 3 - EXECUTION

3.01 WORKMANSHIP - SHEET METAL WORK

- A. Work shall be accurately formed to sizes, shapes and dimensions indicated and detailed, with all angles and lines in true alignment. All Work shall be straight, sharp, and erected plumb and level in proper plane without bulges or waves. Form sheets with a bending brake to the profiles detailed. Shaping and hand seaming shall be shop processed insofar as practical.
- B. Fabricate and erect all Sheet Metal Work to perform satisfactorily.
- C. Fabricate all items in maximum lengths and hold all joints to a minimum.
- D. Cooperate with all other subcontractors, and arrange for installation of sheet metal in connection with their Work.

3.02 INSTALLATION OF FLASHING AND SHEET METAL WORK

- A. Prefinished Gutters and Downspouts:
1. Fabricate and install prefinished gutters and downspouts as detailed on Drawings and specified herein.
 2. Hanging gutter installation shall conform with similar detail at FIGURE 1-12 - HANGING GUTTER INSTALLATIONS - GENERAL of SMACNA Manual, and shall consist of continuous cleat, gutter, gutter spacer, and gutter brackets as shown on Drawings.
 3. Fabricate gutter of galvanized sheet steel in Rectangular Type Gutter Style, per "Style I" shown on FIGURE 1-2 RECTANGULAR TYPE GUTTER STYLES OF SMACNA Manual, and as detailed on the Drawings.

4. Furnish and install strainers, inserted into downspout inlets. Furnish and install all outlet tubes, and gutter ends.
 5. Furnish and install downspouts of plain round design as detailed on the Drawings, fabricated of galvanized sheet steel, in sizes and locations shown on the Drawings.
 6. Fabricate downspout hanger according to FIG 1-35D, FIGURE 1-35, DOWNSPOUTS - HANGER DESIGN of SMACNA Manual. Secure downspouts with hangers to wall at 6 ft. centers, maximum.
 7. All fasteners and accessories shall be of compatible material.
- B. Miscellaneous Flashing and Sheet Metal Work: Complete all Miscellaneous Flashing and Sheet Metal Work indicated or required, whether or not specified herein.
- C. Pitch Pockets: PITCH POCKETS ARE PROHIBITED.

3.03 REPLACEMENT

- A. Defective Materials: Promptly replace all defective materials and workmanship, at no cost to the Owner, to the satisfaction of the Architect.
- B. Damaged Salvaged Materials: Salvaged materials retrieved from demolition operations that are found to be beyond serviceable/useable condition; shall be replaced with new materials. Provide as required by field conditions; new materials to match with existing as shown and noted on the Drawings.

3.04 PAINTING

- A. Prefinished Materials:
1. Touch-up prefinished items damaged during installation.
 2. Paint shall be of same type and color to match factory-applied shop finish.
 3. Kynar 500® Polyvinylidene Fluoride (PVDF) finish surface imperfections or minor scratches shall be touched-up using a coating based upon "Kynar ADS®" PVDF resin as supplied by Licensee.
- B. Field Painting: Finish painting of materials where required by Drawings and/or field conditions shall be by the Painting Contractor.
- C. Compatibility: Paint shall be compatible with roofing materials.

3.05 CLEAN-UP

- A. Work Required: Clean-up any Work soiled in the performance of Work under this section.
- B. Debris and Waste Materials: During progress of the Work the premises shall be kept free of all debris and waste materials resulting from the Work of this section. During progress of the Work, upon completion of Work, and before final acceptance of the Work, remove all construction debris and rubbish from the site, and dispose of legally.
- C. Unused Materials, Tools, and Equipment: Upon completion and before final acceptance of the Work, remove all unused materials, tools, and equipment from the site.

END OF SECTION

SECTION 07 70 00ROOF AND WALL SPECIALTIES AND ACCESSORIES

The requirements of the "General Conditions", the "Supplementary Conditions", and "Division 1" sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Furnish and/or provide all labor, materials, equipment and services necessary for Roof and Wall Specialties and Accessories indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:
1. Roof Hatches.
 2. Ladder Safety Posts.
 3. Pipe Supports.
 4. Pipe Flashings/Seals, as required by field conditions.
 5. Walkway Roof Pads.
 6. Concrete Splash Blocks.
- B. Related Sections: The following items of related Work will be provided under other sections of the Specifications:
1. Structural Precast Concrete - Section 03 41 13.
 2. Steel Roof Access Ladders - Section 05 50 00.
 3. Rough Carpentry - Section 06 10 00.
 4. Installation of Roofing Specialties and Accessories - Section 07 53 23.
 5. Roof Flashings - Section 07 60 00.
 6. Finish Hardware for Roof Hatches - Section 08 70 00.
 7. Exterior Finish Painting - Section 09 91 13.
 8. Prefabricated Roof Curbs - Division 23.

1.02 APPLICABLE STANDARDS

- A. Codes and Reference Specifications: Except as otherwise specified herein, material and workmanship shall conform to the following current codes and specifications.
1. All applicable Local Building Codes and Ordinances.

1.03 QUALITY ASSURANCE

- A. Standards: All materials and systems shall meet local building code requirements in the State of the proposed Project for fire spread, uplift resistance, and wind loads local to Project site.

1.04 SUBMITTALS

- A. General: Submit Shop Drawings and Product Data to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Shop Drawings: Prepare and submit complete Shop Drawings, indicating each product construction, installation details, and control dimensions to allow for accurate preliminary framing and installation procedures.
- C. Product Data: Submit Product Data for each manufacturer's factory/shop fabricated product specified under Work of this section.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver all products, materials, and accessories at location designated by the General Contractor.
- B. Storage: Store all products and materials at the site above the ground. Cover all materials with waterproof coverings to prevent water absorption from rain and condensation. Handle all materials to prevent damage. Materials shall not be dumped in piles or placed directly on ground.

1.06 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or repairing imperfections. The warranty period shall be not less than five (5) years from date of Owner's acceptance of installation.

PART 2 - PRODUCTS

2.01 ROOF HATCHES

- A. Manufacturer: Commercial roof hatch specified herein shall be such as manufactured by The Bilco Company, P.O. Box 1203, New Haven, CT 06505, (800)366-6530 or (203)934-6363, www.bilco.com.
- B. Comparable Products: Roof hatch by the following manufacturers may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.
 - 1. Babcock-Davis, 9300 73rd Avenue North, Brooklyn Park, MN 55428, (888)412-3726 or (763)488-9247; www.babcockdavis.com.
 - 2. Milcor, Commercial Products Group of Hart & Cooley, Inc., 815 Kimberly Drive, Carol Stream, IL 60188, (800)624-8642; www.milcorinc.com.
- C. Type: Factory preassembled from the manufacturer, single leaf metal roof hatch, Bilco® Roof Hatch "Type S-20", size: 2' - 6" x 3' - 0".

- D. Cover: Breakformed, hollow metal design, 14 gauge paint bond G-90 galvanized steel, with 3" beaded, overlapping flange, fully welded at corners, 1" thick concealed fiberglass insulation, internally reinforced for 40 psf live load, fully covered and protected by a 22 gauge paint bond G-90 galvanized steel metal liner.
- E. Curb: 12" in height, 14 gauge, paint bond G-90 galvanized steel. Curb shall be formed with 3-1/2" mounting flange with 7/16" holes provided for securing to the roof deck. Curb shall have integral metal capflashing of same gauge and material as the curb, fully welded at corners for weathertightness. Insulation on exterior side shall be 1" thick rigid high-density fiberboard.
- F. Factory Finish: Alkyd based red oxide prime paint bond on galvanized steel.
- G. Construction and Hardware: Factory assembled with heavy-duty pintle hinges with 3/8" Type 316 stainless steel pins, compression spring operators enclosed in telescopic tubes, spring latch with interior and exterior turn handles and padlock hasps, and heavy extruded EPDM rubber gasket. Cover shall automatically lock in the open position with an automatic rigid hold-open arm, equipped with red vinyl grip handle for one hand release. Compression spring tubes shall be an anti-corrosive composition material and steel compression springs shall be of carbon steel, coated and packed in grease. All other hardware shall be zinc plated and chromate sealed.
- H. Anchoring Devices: Furnish anchoring devices compatible with base frame.
- I. Design: Structurally sound, capable of withstanding all weather conditions common to the building site. Cover shall be reinforced to support a live load of not less than 40 p.s.f. vertically. Roof hatch shall be capable of resisting winds local to Project site, horizontally, without damage, displacement, distortion, or leaking.

2.02 LADDER SAFETY POSTS

- A. Manufacturer: The Bilco Company, P.O. Box 1203, New Haven, CT 06505, (800)366-6530 or (203)934-6363; www.bilco.com.
- B. Model: Bilco® Model LU-1 LadderUP® Safety Post, fully factory assembled, complete with Type 316 stainless steel adjustable mounting hardware and fasteners for securing to rungs of fixed ladders in accordance with the manufacturer's instructions.
- C. Material and Finish: Manufacturer's standard, steel, with safety yellow powder coat finish.
- D. Construction: Safety post shall be manufactured of high strength square tubing with telescoping tubular section that locks automatically when the operator opens the roof hatch and raises the post to its fully extended raised position above the roof level. Upward and downward movement shall be easily controlled by a stainless steel spring balancing mechanism with a release lever to allow the post to be returned to its original lowered retracted position.

2.03 PIPE SUPPORTS

- A. Preformed Roller Bearing Pipe Supports:
 - 1. Manufacturer: Miro Industries, Inc., 844 South 430 West, Suite 100, Heber City, UT 84032, (800)768-6978 or (801)975-9993; www.miroind.com.
 - 2. Product: Furnish Models 3-R-2 and/or 3-R-4 Polycarbonate Pillow Block Pipestand, and "Pipe Straps" where required by code.
 - a. Accessories: Provide as required by field conditions, manufacturer's associated stackable 3-R Spacers.

- B. Pipe Support Product Verification: Contractor shall verify pipe support products as indicated on the Drawings and/or specified herein for coordinated size requirements in order to provide actual physical contact and support of pipes as required. Report to the Architect in writing, any discrepancies from Specifications and Drawings, and actual conditions at the site.
- C. Comparable Products: Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.

2.04 PIPE FLASHINGS/SEALS

A. Pipe Flashings:

- 1. Manufacturer: Pipe flashings specified herein shall be such as manufactured by Portals Plus, Commercial Products Group of Hart & Cooley, Inc., 815 Kimberly Drive, Carol Stream, IL 60188, (800)624-8642; www.milcorinc.com.
 - a. Flashing System - Single or Multiple Pipe Penetrations: Where required by Drawings and/or field conditions; furnish Factory fabricated flashing system for single or multiple pipe penetrations of single ply roofing systems or in built-up roofing systems shall be such as Portals Plus, "Pipe Boots" and/or "Quadraseals". Flashing shall be molded of not less than 60 mil (0.060") thick EPDM or Neoprene and shall be ozone and ultraviolet resistant, with a serviceable temperature range of -60F° to +270°F minimum. Base flange shall be feather edged, and unit shall include conically shaped steps with molded ribs and stainless steel clamps. Provide flashings in color matching roofing materials.
 - b. Curb Mounted Pipe Flashing System: Where required by Drawings and/or field conditions; furnish Factory fabricated, curb mounted pipe flashing system for single or multiple pipe penetrations through single ply roofing. Pipe flashing system shall be Portals Plus, "Pipe Portal® Systems". System shall include prefabricated roof curb, laminated acrylic coated ABS plastic curb cover with prepunched mounting holes and molded sealing rings on the collar opening, and an EPDM compression molded rubber cap, and stainless steel clamps.

B. Pipe Seals:

- 1. Manufacturer: Pipe seal specified herein shall be such as manufactured by The Pate Company, 245 Eisenhower Lane South, Lombard, IL 60148, (800)243-3018 or (630)705-1920; www.patecurbs.com.
 - a. Product: Pate® pipe seal assemblies (pps-size as required). Where required by Drawings and/or field conditions; furnish Factory fabricated combination flashing and sealing assembly including one-piece spun aluminum base with roof surface flange, sloped where required, with graduated step PVC boot, and adjustable stainless steel clamps.
- C. Comparable Products: Pipe flashings and/or pipe seals by manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.

2.05 WALKWAY ROOF PADS

- A. Product for EPDM Roofing System: Protective membrane walkway roof pads for use on EPDM Roofing Systems shall be "GenFlex FlexGuard™ Peel & Stick™ Walkway Pads" as manufactured by GenFlex Roofing Systems, 250 West 96th Street, Suite 150, Indianapolis, IN 46260, (800)443-4272; www.genflex.com. Pads shall be compatible and acceptable with the roofing system manufacturer.

1. Walkway Roof Pads: Prefabricated walkway pads on roof areas as shown on the Drawings, and for use as a protective membrane with roof accessories, shall be 30" x 30" x 5/16" thick, unless otherwise indicated.
2. Comparable Products: Walkway roof pads by other manufacturers may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.

2.06 CONCRETE SPLASH BLOCKS

- A. Manufacturers: Precast concrete splash blocks specified herein shall be as manufactured by one of the following.
 1. Bush Concrete Products, Inc., 3584 Airline Road, Muskegon, MI 49444, (231)733-1904 or (800)866-2874; www.bushconcreteproducts.com.
 2. Hanover® Architectural Products, 5000 Hanover Road, Hanover, PA 17331, (800)426-4242 or (717)637-0500; www.hanoverpavers.com.
- B. Comparable Products: Splash blocks by other manufacturers may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.
- C. Precast Concrete Splash Blocks: Nominal 12" x 36" of not less than 4000 p.s.i. (minimum) compressive strength at 28 days, air-entrained concrete with smooth and unbroken surfaces.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Unless otherwise specified, furnish to the Roofing Contractors all roof specialties and accessories as indicated on the Drawings and specified herein, complete with all required sealants, anchoring devices, and miscellaneous accessories in accordance with manufacturer's recommendations. Unless otherwise noted on the Drawings, furnish all shimming accessories of materials compatible with roof construction.
 1. Concrete Splash Blocks: Install splash blocks at ground level metal downspout locations as indicated on the Drawings.
- B. Ladder Safety Posts: Provide factory assembled safety posts and all required bolts and fasteners for installation to steel roof access ladder as indicated on the Drawings and/or required by field conditions.
 1. Inspection(s): Verify that ladder safety post installation(s) will not disrupt other trades. Verify that the ladder rungs are dry, clean, and free of foreign matter. Report and correct defects prior to any installation.
 2. Installation(s):
 - a. Submit product design drawings for review and approval to the Architect before fabrication.
 - b. Installer shall check as-built conditions and verify the manufacturer's ladder safety post details for accuracy to fit the application prior to fabrication. The installer shall comply with the ladder safety post manufacturer's written installation instructions.

- c. Installer shall use only manufacturer furnished fasteners necessary for installing ladder safety post on ladder(s).

3.02 ROOF HATCH

A. General:

1. Roof hatch shall be provided in strict accordance with the Contract Documents, the approved submittals and the manufacturer's instructions.
2. The complete installation shall be weathertight.

B. Fabrication:

1. Shop prefabricate the roof hatch verifying all measurements at the job site prior to fabrication.
2. Fabricate in strict accordance with the approved submittals and the manufacturer's published recommendations.
3. Weld or mechanically fasten along entire line of contact on the unexposed side.

C. Installation:

1. All members shall be installed with adequate provision for settling, expanding and contracting to occur without breaking the weatherseal.
2. All members shall be firmly anchored using all anchoring devices required to ensure positive attachment of the members for long life under hard use.
3. Protect all finished surfaces as necessary to prevent damage during progress of the Work.

D. Cleaning Up:

1. Immediately prior to acceptance of the Work, remove all protective materials from the roof hatch system and clean all exposed members.
2. Do not use abrasive or harmful cleaning agents.

END OF SECTION

SECTION 07 72 53SNOW GUARDS

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, and equipment required to perform Snow Guard Work, as shown on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Coordinate with the installation of the roof to assure proper placement of the snow guards.
 - 2. Snow Guards, provided at main office roof area. Provide Snow Guards compatible with the accepted roofing manufacturer and product. Contractor shall verify that the product is acceptable with the roofing manufacturer.
- B. Related Work: The following items of related Work will be provided under other sections of the Specifications, as indicated:
 - 1. Metal Building Systems - Section 13 34 19.

1.02 APPLICABLE STANDARDS

- A. Codes and Reference Specification: Except as otherwise specified herein, material and workmanship shall conform to the following current codes and specifications.
 - 1. All applicable Local Building Codes and Ordinances.
 - 2. ASTM International Standard Specifications referred to herein by number.
 - 3. Architectural Sheet Metal Manual, hereinafter referred to as “SMACNA Manual”, as issued by the Sheet Metal and Air Conditioning Contractors’ National Association.

1.03 QUALITY ASSURANCE

- A. General: All materials shall be securely fastened in place in a watertight, neat and workmanlike manner. All workmen shall be thoroughly experienced in the particular class of Work upon which employed.
- B. Standards: All materials and systems shall meet local building code requirements for fire spread, uplift resistance, and wind loads.
- C. Installer: Firm shall have not less than three (5) years of prior successful experience with installation of specified roofing material and snow guards and scope equivalent to Work of this section.
- D. Protective Strippable Film: Provide materials delivered to site with protective film.

1.04 SUBMITTALS

- A. General: Submit Shop Drawings, Product Data, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Shop Drawings: Submit roof drawings showing locations of all assemblies, including spacing and fastening requirements for snow retention system.
- C. Product Data: Submit manufacturer's specifications, installation instructions and general recommendations for snow guard applications. Include certification or other data substantiating that materials comply with requirements.
- D. Samples:
 - 1. Snow Guards: Submit Samples of snow guards and associated materials.

1.05 MATERIAL DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver only acceptable materials to the site in original boxes, crates, wrappings, properly packaged for protection against damage in transportation, clearly labeled with all pertinent information, to facilitate checking. Upon receipt of panels and other materials and components, installer shall examine the shipment for damage and completeness.
- B. Storage: Store and field protect materials at the site off the ground and in properly protected clean and dry storage facilities until ready for use. Stack all materials to prevent damage and to allow for adequate ventilation.
- C. Handling: Exercise care in unloading, storing and installing all components to prevent bending, warping, twisting, and surface damage. Replace any damaged materials.

1.06 INSPECTION, PREPARATION, AND COORDINATION

- A. Carefully inspect all surfaces upon which Snow Guard Work is to be applied; and notify the General Contractor in writing, for correction, of any condition detrimental to the installation of Snow Guard Work. The installation of any materials will be considered Contractor's acceptance of the surface to be covered. If any defective Work is covered in, the removal and replacing of Snow Guards Work shall be done by Snow Guard Contractor, without cost to the Owner.
- B. Removal of temporary structures, tools, equipment, and loose rubbish and debris incidental to Work of other trades will be by the trades concerned. Perform other cleaning and preparatory Work (including snow removal) as necessary to prepare the surfaces to receive Snow Guard Work.
- C. Coordinate Work of this section with the related Work of other Contractors.

1.07 SCAFFOLDING

- A. Furnish, erect, and maintain all scaffolding and ladders in accordance with governing local, state, and national safety codes. Erect equipment at times and locations so as not to delay any part of Work. When no longer required, promptly dismantle equipment and remove from the site.

1.08 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the period specified, and any damage to other Work caused by such imperfections or by the repairing of same. The period of warranty shall be not less than one (1) year from date of Owner's acceptance.

PART 2 - PRODUCTS

2.01 SNOW GUARDS

- A. Manufacturer: Snow guards specified herein shall be such as manufactured by SNO-GEM, INC., 4800 Metalmaster Way, McHenry, IL 60050, (815)477-4367 or (888)766-4367; www.snogem.com.
- B. Plastic Snow Guards: Sno-Gem™ Original Polycarbonate Snow Guards (5" x 5" Base) polycarbonate material construction snow guard units with minimum 25 sq. inch bonding surface. Plastic snow guard construction shall contain a ultraviolet stabilizer to prevent damage and discoloring from exposure to sunlight, and be unaffected by climate extremes.
1. Color: Snow guards shall be crystal clear, colorless and transparent.
- C. Materials:
1. Polycarbonate Polymer Material Construction: Plastic snow guard construction shall be of material as manufactured by such as one of the following, or approved equal.
 - a. General Electric "Lexan".
 - b. Bayer "Makrolon".
 - c. Durolon.
 2. Adhesive Tape: Double coated acrylic foam tape, "Scotch VHB™" by 3M™, factory applied to snow guards by manufacturer.
 3. Primer: Snow guard manufacturer's recommended "Tape Primer 94" shall be used for adhesion of adhesive tape to metal surface.
 4. Sealant: Provide manufacturer's recommended and required sealant.
- D. Comparable Products: Snow guards by manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

- A. Inspection: Inspect structure on which snow guard system is to be installed and verify that it will withstand any additional loading that it may incur. Notify general contractor of any deficiencies before installing snow guards.

- B. Verify Existing Conditions: Verify that the roofing material has been installed correctly prior to installing snow guards.

3.02 SNOW GUARD INSTALLATION

- A. General: Install plastic snow guards in areas indicated on Drawings and/or specified herein, in accordance with the manufacturer's specifications and recommendations on snow guard location and spacing.
- B. Preparation: Thoroughly clean metal roof surface area with isopropyl alcohol where snow guard is to be installed.
- C. Installation: Provide non-penetrating, fully adhered installation of snow guards to prefinished metal roofing.
 - 1. Adhesive Tape Installation:
 - a. Apply thin coat of primer to roof surface.
 - b. Peel release paper backing off adhesive tape on snow guard base.
 - c. Place snow guard in position on metal surface in diagonal orientation, applying firm, even pressure perpendicular to roof surface.
 - d. Apply bead of sealant as recommended by snow guard manufacturer around each snow guard perimeter.
 - e. Contractor shall contact snow guard manufacturer for time periods and ambient temperatures required for full curing of adhesive tape.
- D. Fall Protection: Provide all necessary fall and other hazard protection in accordance with Occupational Safety and Health Administration (OSHA) regulations when installing snow guards. At no time are snow guards to be used as a climbing device.

3.03 DAMAGED WORK

- A. All damaged or defective Work shall be replaced by new Work, to the satisfaction of the Architect, at no cost to the Owner. Work which becomes damaged in the replacing of defective Work shall be repaired or replaced by Snow Guard Contractor at no cost to the Owner. Patched Work will not be accepted.

3.04 CLEANING AND TOUCH-UP

- A. At completion of erection, wash or clean as recommended by the snow guard manufacturer, all exposed surfaces as required to remove all contaminants, grease, finger marks or stains from the panels. Touch-up all areas of marred paint, and all screw and bolt heads, on exterior, with paint of type and color to match shop finish.

3.05 CLEAN-UP

- A. Work Required: Clean-up any Work soiled in the performance of Snow Guard Work.
- B. Debris and Waste Materials: During progress of the Work, keep the premises free of all debris and waste materials resulting from the Work of this section. During progress of the Work, upon completion of Work, and before final acceptance of the Work, remove all scrap, construction debris and rubbish to

central area designated by the General Contractor for general clean up by the General Contractor , or if so directed by the General Contractor, remove and dispose of off-site, legally.

- C. Unused Materials, Tools, and Equipment: Upon completion of Work and before final acceptance of the Work, remove all unused materials, tools, and equipment from the site.

END OF SECTION

SECTION 07 84 56FIRE SAFING

The requirements of the "General Conditions", the "Supplementary Conditions", and "Division 1" sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, and services necessary for Insulation Work indicated on the Drawings and/or required by field conditions, and as specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Fire Safing Insulation.
- B. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:
 - 1. Concrete Work - Section 03 30 00.
 - 2. Structural Precast Concrete - Section 03 41 13.
 - 3. Masonry - Section 04 20 00.
 - 4. Rough Carpentry Work - Section 06 10 00.
 - 5. Sheet Metal Work - Section 07 60 00.
 - 6. Joint Protection - Section 07 90 00.
 - 7. Non-Structural Metal Stud Framing - Section 09 22 16.
 - 8. Gypsum Wallboard Construction - Section 09 29 00.
 - 9. Metal Building Systems - Section 13 34 19.

1.02 SUBMITTALS

- A. General: Submit Samples and manufacturer's literature to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Samples: Submit two (2) 12" x 12" typical Samples of insulation type.
- C. Manufacturer's Literature: Submit three (3) sets of manufacturer's specification data for type of insulation specified herein.

1.03 MATERIAL DELIVERY AND STORAGE

- A. Delivery: Deliver only acceptable materials to the site in original boxes and wrappings, clearly labeled with all pertinent information to facilitate checking.

- B. Storage: Store materials at the site off the ground and in properly protected dry storage facilities, until ready for use. Provide a tarpaulin covering over the materials, securely tied down. Wet, damp, or damaged materials shall not be used.

1.04 SCAFFOLDING

- A. As required by field conditions; furnish, erect, and maintain all scaffolding and ladders in accordance with applicable code requirements. Erect at times and locations so as not to delay any part of the Work, and promptly remove when no longer required.

1.05 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form warranting all materials and workmanship to remain in serviceable and satisfactory condition, and make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

PART 2 - PRODUCTS

2.01 SAFING INSULATION

- A. Manufacturer: Safing insulation specified herein shall be as manufactured by Thermafiber, Inc., 3711 Mill Street, Wabash, IN 46992, (888) 834-2371 or (260)563-2111; www.thermafiber.com.
 - 1. Insulation: Thermafiber® Safing Insulation, mineral-wool type insulation, UL
Reference = TYPE SAF, with approximate density of 4.0 to 6.0 pcf.
- B. Comparable Products: Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.
- C. Surface Burning Characteristics: Class A fire hazard classification in accordance with ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 1. Regular (Unfaced): Flame Spread 0, and Smoke Developed 0.
 - 2. Foil-Faced: Flame Spread maximum 25, and Smoke Developed 0.
- D. Type and Quality: Rated noncombustible as defined by National Fire Protection Association NFPA Standard 220, when tested in accordance with ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750° C. Insulation shall be nonasbestos, moisture-resistant, noncorrosive, nondeteriorating, mildew-proof and vermin-proof.
- E. Clips and Adhesives: Provide manufacturer's recommended galvanized steel safing clips and fire-resistant adhesives for installation of safing insulation.

PART 3 - EXECUTION

3.01 SAFING INSULATION INSTALLATION

- A. Provide and install safing insulation at locations as indicated on the Drawings and/or required by field conditions.
- B. Provide and install safing insulation (fire-stop insulation) at all openings through fire-rated partitions, and as indicated on the Drawings and/or required by field conditions.
- C. Safing insulation shall be cut slightly larger than the opening. Compress and tightly fit safing insulation into the specified openings, and locations, where indicated on the Drawings.

3.02 CLEAN-UP

- A. Work Required: Clean-up any Work soiled in the performance of the Work under this section.
- B. Debris and Waste Materials: During progress of the Work, upon completion of Work, and before final acceptance of the Work, keep the premises free of debris and waste materials resulting from Work of this section. Remove all construction debris and rubbish to central area designated by the General Contractor, for general clean-up by the General Contractor, or if directed by the General Contractor to remove from the site and legally dispose.
- C. Unused Materials, Tools, and Equipment: Upon completion of Work and before final acceptance of the Work, remove all unused materials, tools, and equipment from the site.

END OF SECTION

SECTION 07 90 00JOINT PROTECTION

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, equipment, and services necessary for Joint Protection (Caulking) Work indicated on the Drawings and specified herein. Work includes, but is not limited to the following:
1. Provide joint sealers not provided elsewhere; type suitable for application indicated with accessories as required for complete installation.
 2. Provide exterior caulking for areas and surfaces disturbed or disrupted by construction activities.
 3. Preparation of surfaces.
 4. Exterior and interior caulking of the following joint types. Exterior caulking shall be done with sealants, and interior caulking shall be with caulking compounds, however, selected interior locations noted on Drawings or specified herein will require sealant in lieu of caulking compound.
 - a. Between dissimilar materials, including concrete or masonry to metal (aluminum, steel, stainless steel), and steel to aluminum (at non-metallic shims).
 - b. Between similar materials as detailed, unless specifically excluded.
 5. Expansion and control joints.
 6. Between thresholds and adjoining materials.
 7. Exterior joints where Mechanical and Electrical Work penetrates precast concrete wall panels, concrete, masonry, or metal panels.
 8. Wherever indicated by the words, “Seal”, “Sealer”, “Sealant”, “Caulk”, or “Caulking” on the Drawings.
 9. Compressible Back-up Material as required.
 10. Cleaning and removing excess materials.
- B. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:
1. Joint Sealant for Concrete Sidewalks - Section 03 30 00.
 2. Miscellaneous Metal Work - Section 05 50 00.
 3. Rough Carpentry - Section 06 10 00.

4. Thermal Insulation - Section 07 21 00.
5. Sheet Metal Work - Section 07 60 00.
6. Pressed Steel Door Frames - Section 08 11 13.
7. Gypsum Wallboard Construction - Section 09 29 00.
8. Exterior Painting and Finishing - Section 09 91 13.
9. Interior Painting and Finishing - Section 09 91 23.
10. Metal Building Systems - Section 13 34 19.

1.02 QUALITY ASSURANCE

- A. General: All material incorporated in the Work shall be subject to the Architect's and Owner's review. Methods of preparation, construction, and installation shall be in accordance with manufacturer's printed specifications, unless otherwise directed by the Owner's Representative.
- B. Installer Qualifications: Firm with minimum five (5) years successful experience on projects of similar type and size, using specified products.

1.03 SUBMITTALS

- A. General: Submit Product Data and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Product Data: Submit manufacturer's specification and recommendations for each type of sealant, caulking compound, expansion joint cover, and miscellaneous material required.
- C. Sealant Compatibility and Test Reports: Provide reports from sealant manufacturer certifying that materials forming joint substrates of system have been tested for compatibility and adhesion with joint sealants; include sealant manufacturer's interpretation of results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
- D. Samples: Submit Samples of sealants and caulking for review and approval by the Architect. Do not commence Work until the Architect's written approval of the Samples has been received.
 1. General: Submit two (2) 12" long Samples of each color and type of exposed-to-view sealant and caulk. Install Sample in 1/2" wide joints between two (2) strips of material representative of exposed surfaces adjacent to joint sealants.
 - a. Unacceptable Samples: Manufacturer's color charts and/or color swatches will not be accepted as Samples.

1.04 PRODUCT DELIVERY AND STORAGE

- A. Delivery: Ship material to job site in plainly marked, original containers, with seals unbroken. Do not ship opened or partially full containers to the site. Materials will be subject to inspection, and rejection at any time. Unload materials at locations designated by the General Contractor.
- B. Storage: All materials shall be stored in sheltered enclosures with ambient temperature range of 60 to 80 degree F° at the site until ready for use.

- C. Material Shelf Life: Do not retain material at the jobsite which has exceeded the shelf life recommended by the manufacturer.

1.05 PROJECT CONDITIONS

- A. Temperature and Temporary Enclosures: Do not install compounds when ambient air temperature is less than 40°F. or when recesses are wet or damp. Temporary enclosures and temporary heat may be provided to maintain temperature requirements.
- B. Protection: Adjacent finished surfaces shall be protected from damage, by masking or other approved methods, prior to sealing. Remove protection when no longer needed, clean adjacent surfaces smeared by compounds.

1.06 SCAFFOLDING

- A. Furnish, erect, and maintain all scaffolding and tarpaulin enclosures, complying with governing code requirements. Erect apparatus at times and locations so as not to delay any part of Work. When Work has been completed, promptly dismantle all scaffoldings and remove from site.

1.07 WARRANTY

- A. General Requirements: The warranty shall state that the Contractor will make good at his expense, all imperfections which may develop in Caulking and Sealing Work during the warranty period, as well as damage to other Work caused by imperfections or by repairing imperfections.
 - 1. Repair or replace joint sealers which fail to perform as intended, because of leaking, crumbling, hardening, shrinkage, bleeding, sagging, staining and loss of adhesion.
- B. Sealant Work: Execute a warranty in the approved written form, warranting all Sealant Work to remain in a serviceable, watertight, elastic, adhesive and perfect condition for a period of not less than three (3) years from date of Owner's acceptance of the installation.
- C. Caulking Work: Execute a warranty in the approved written form, warranting all Caulking Work to remain in a serviceable, watertight, elastic, adhesive and perfect condition for a period of not less than two (2) years from date of Owner's acceptance of the installation.

PART 2 - PRODUCTS

2.01 JOINT PROTECTION MATERIALS

- A. General:
 - 1. Colors: Sealants and caulking compounds shall be of colors as selected and/or reviewed by the Architect to match adjacent finish surfaces.
 - 2. Grade and Consistency: Sealants and caulking compounds shall be of correct grade and consistency for application, to flow easily from application gun, and to tool without excessive tackiness.
 - 3. Material Properties: Set sealants and caulking compounds shall be waterproof, elastic, non-staining and non-corrosive; firm but not brittle hard; remain plastic without cracking at low temperatures; non-sagging at temperatures up to 120°F for 24 hours.

4. Comparable Products: Comparable equivalent sealant and caulking compound products of other manufacturers may be acceptable, subject to conformance with these Specifications and the Architect's review.

B. Sealants:

1. Sealants - General: Multiple-component polyurethane sealant, non-sag type, in accordance with ASTM C920 - Standard Specification for Elastomeric Joint Sealants, Type M, Grade NS, and Federal Specification TT-S-00227E, Type II, Class A, by one of the following manufacturers:
 - a. Manufacturer: BASF Corporation - Building Systems, 889 Valley Park Drive, Shakopee, MN 55379, (800)243-6739 or (800)433-9517; www.master-builders-solutions.basf.us.
 - 1) Product: MasterSeal® NP 2™.
 - b. Manufacturer: Pecora Corporation, 165 Wambold Road, Harleysville, PA 19438, (800)523-6688 or (215)723-6051; www.pecora.com.
 - 1) Product: DynaTrol® II.
 - c. Manufacturer: Tremco, Incorporated, Commercial Sealants & Waterproofing Division, 3735 Green Road, Beachwood, OH 44122, (800)321-7906 or (216)292-5000; www.tremcosealants.com.
 - 1) Product: Dymeric® 240FC.
2. Sealant for Traffic Areas: One-component polyurethane sealant, non-sag type, for use in traffic areas, in accordance with ASTM Standard C920, by one of the following manufacturers:
 - a. Manufacturer: BASF Corporation - Building Systems, 889 Valley Park Drive, Shakopee, MN 55379, (800)243-6739 or (800)433-9517; www.BuildingSystems.BASF.com.
 - 1) Product: Sonneborn® Sonolastic® NP 1™.
 - b. Manufacturer: Tremco, Incorporated, Commercial Sealants & Waterproofing Division, 3735 Green Road, Beachwood, OH 44122, (800)321-7906 or (216)292-5000; www.tremcosealants.com.
 - 1) Products: Dymonic® 100 or Vulkem® 45 SSL.
 - c. Manufacturer: LymTal International, Inc., 4150 S. Lapeer Road, Lake Orion, MI 48359, (248)373-8100; www.lymtal.com.
 - 1) Product: Iso-Flex® 830, Joint Sealant.

C. Caulking Compounds:

1. Caulking Compounds - General: One-part, acrylic latex sealant, non-sag type, conforming to ASTM C834 - Standard Specification for Latex Sealants, by one of the following manufacturers:
 - a. Manufacturer: Pecora Corporation, 165 Wambold Road, Harleysville, PA 19438, (800)523-6688 or (215)723-6051; www.pecora.com.
 - 1) Product: AC-20® + Silicone.

- b. Manufacturer: Tremco, Incorporated, Commercial Sealants & Waterproofing Division, 3735 Green Road, Beachwood, OH 44122, (800)321-7906 or (216)292-5000; www.tremcosealants.com.
 - 1) Product: Tremflex® 834.
- D. Miscellaneous Materials: Primers, Sealers, Joint Cleaners, Bond Breaker Tape, and Sealant Backer Rods as recommended by Sealant Manufacturer for applications indicated.
 - 1. Primers: Provide primer products recommended by the sealant or caulking compound manufacturer, to provide adhesion of the sealant and caulking compounds to, and to prevent staining of adjacent surfaces.
 - 2. Back-up Material:
 - a. Manufacturer: Nomaco Engineered Foam Solutions, 3006 Anaconda Road, Tarboro, NC 27886, (877)291-1157; www.nomacoefs.com.
 - b. Backer Rods: Provide backing material such as NOMACO® HBR® (Closed-Cell Backer Rod), round, foam rod, cylindrical, flexible, extruded, polyethylene foam backer rod, Type C - per ASTM C1330-Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants. Backer rods shall be oversized 25 percent to 50 percent to fit tightly into the joint and function as a bond breaker to prevent back-side adhesion of the sealant.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Inspect all joints to be caulked. Notify the General Contractor in writing (copy to the Architect), of any condition that will prevent the required performances of the compounds, for correction. Installation of the compounds will be considered Contractor's acceptance of the joints. Promptly repair or replace all Caulking and Sealing Work that becomes damaged or defective because of defects in the joint surfaces, to the satisfaction of the Architect, and at no cost to the Owner.

3.02 PREPARATION

- A. Clean joint surfaces immediately before installation of joint sealer, and prime or seal joint surfaces as recommended by manufacturer.
- B. Joints to be caulked will be raked out or left open 3/8" to 1/2" deep, maximum by others. Joint width to be 1/2" maximum, 3/8" width for control joints.
- C. Clean recesses to receive compound so as to be free of dirt, dust, loose material, oil, grease, and all other substances detrimental to the material's performance. Remove lacquer or other protective coatings from metal surfaces, without damage to the surface, prior to sealing. Recesses shall be dry when compounds are installed.
- D. If sealing or caulking compounds cause stains on, or do not adhere to, adjacent materials, or if recommended by compound manufacturer, prime all surfaces with specified primer in accordance with compound manufacturer's recommendations.

- E. Width or depth of the joint shall be not less than 1/4". In joints up to 1/2" wide, the depth of the sealant shall be equal to the width. In joints wider than 1/2", but not exceeding 1", the depth shall be maintained at 1/2". Joints wider than 1" shall maintain a width to depth ratio of 2 to 1. Fill recesses with backer rod, held back the specified depth from the surface, where joint depths exceed the specified maximums.
- F. If joints to receive sealant are filled with other than backer rod specified material, adhere a strip of polyethylene film over the exposed edge of the material, to break the bond of the sealant.
- G. Use materials as manufactured, without additives or adulterations. Mix two (or three) component materials until thoroughly and uniformly blended, and then install such materials prior to start of hardening or curing of the materials.

3.03 INSTALLATION OF SEALANTS AND CAULKING COMPOUNDS - GENERAL

- A. Comply with manufacturer's printed installation instructions and ASTM C1193 – Standard Guide for Use of Joint Sealants.
 - 1. Employ installation techniques which will ensure joint sealers are deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of bond surfaces.
- B. Sealants and caulking compounds for use in any one area shall be of one brand throughout; mixing of brands on a single wall or in a single room or area is prohibited.
- C. All Work shall be done by experienced workmen, in accordance with manufacturer's recommendations, and as specified herein.
- D. Install all sealing and caulking compounds immediately after the adjoining Work of other trades is in proper condition to receive same, but before Work has been given applied finishes such as painting or staining, and in a manner to prevent damage occurring by reason of any delay in providing the Work specified herein. No sealing or caulking shall be done until the General Contractor has inspected and approved the preparatory Work and the condition of the adjoining Work.
- E. Fill joints completely with sealant and/or caulking compound, without extra cost to the Owner, regardless of variance in joint widths.
- F. Install sealants and caulking compounds under pressure, without smearing adjacent surfaces. Compounds shall have full and uniform contact and adhesion with sides of joint recesses.
- G. Finish sealants and caulking compounds in recesses, in angular surfaces, with a smooth surface, flush with face of material at each side. Finish sealants and caulking compounds, in recesses, between masonry and jambs, with a smooth surface, flush with the face of the metal frame on one side and with face of masonry on the other side. Finish sealants and caulking compounds in recesses, in flush surfaces (including masonry walls), with a smooth concave surface, flush with face of material at each side.
- H. Surfaces of sealants and caulking compounds in joints shall be smooth and even, free from dirt, stain or other defacements, and be uniform in color throughout.
- I. Tooling of joints will be allowed, provided that such operations do not damage the seal or tear the compounds.

3.04 INSTALLATION OF SEALING COMPOUNDS

- A. Building Exterior: Fill with sealant, as required to provide a weathertight condition, all exposed joints that are not subject to movement but require finishing, and all joints that are not subject to excessive movement. Principal locations shall include, but not be limited to, the following:
 - 1. Joints Between Dissimilar Materials: All exposed joints in the exterior walls, between dissimilar materials, including masonry or concrete construction to metal (aluminum, steel, stainless steel) such as door frames, frames for glass and other miscellaneous openings; and steel to aluminum (at non-metallic shims).
 - 2. Joints Between Similar Materials: All joints between similar materials such as masonry or concrete control joints, etc., unless specifically excluded.
 - 3. Noted Locations: Wherever indicated by the words “seal” or “sealant” on the Drawings.
- B. Building Interior: Fill with sealant, as required to provide a closed condition, all exposed joints that are subject to movement, but not excessive movement, or where specifically noted on Drawings. Principal locations shall include, but not be limited to the following:
 - 1. Joints Between Dissimilar Materials: All exposed joints in exterior and interior walls, between dissimilar materials generally, including masonry or concrete to metal (aluminum, steel, stainless steel), such as door frames, frames for glass and other openings, and steel to aluminum (at non-metallic shims).
 - 2. Joints Between Similar Materials: All exposed joints between similar materials such as concrete control joints, unless specifically excluded.

3.05 INSTALLATION OF CAULKING COMPOUNDS

- A. Building Interior: At interior of building, fill with caulking compound, all exposed joints not subject to movement that require a finished appearance. Principal locations shall include, but not be limited to the following:
 - 1. Joints in interior walls, between masonry and metal frames.
 - 2. Joints in interior walls, between masonry and adjacent construction.
 - 3. Wherever indicated by the words “caulk” or “caulking” on the Drawings, except if the locations are specified to be sealed.

3.06 CLEANING

- A. Excess Sealing and Caulking Materials: Remove excess sealing and caulking materials from adjacent surfaces before materials have set up. Follow manufacturer's instructions for removal of sealing and caulking materials from finished surfaces. Repair surfaces damaged by sealing and caulking operations. Obtain written approval, from the Architect, of the entire installation after completion.
- B. Debris and Waste Materials: During progress of the Work, keep the premises free of debris and waste materials resulting from Sealing and Caulking Work. During progress of the Work, upon completion of Work, and before final acceptance of the Work, remove all construction debris and rubbish from the site, and dispose of legally. Upon completion and before final acceptance of the Work, remove unused materials, tools, and equipment from the site.

END OF SECTION

SECTION 08 11 13HOLLOW METAL DOORS AND FRAMES

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, material, and services necessary to furnish Hollow Metal Doors and Pressed Steel Frames as indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Pressed Steel Door Frames.
 - 2. Pressed Steel Window Frames.
 - 3. Hollow Metal Doors.
- B. Door and Frame Schedule: Refer to the Drawings.
- C. Related Sections: The following related items of Work will be provided under other sections of the Specifications, as indicated:
 - 1. Masonry - Section 04 20 00.
 - 2. Rough Carpentry - Section 06 10 00.
 - 3. Finish Hardware - Section 08 70 00.
 - 4. Gypsum Wallboard Construction - Section 09 29 00.
 - 5. Finish Painting - Sections 09 91 13 and 09 91 23.
 - 6. Metal Building Systems - Section 13 34 19.
 - 7. Electrical Work - Division 26.

1.02 REFERENCE STANDARDS AND SPECIFICATIONS

- A. Except as otherwise specified herein, design, materials and workmanship shall conform with the requirements of the following current reference standards and specifications.
 - 1. Steel Door Institute (SDI), SDI-100 Recommended Specifications for Standard Steel Doors and Frames – ANSI/SDI A250.8-2003.
 - 2. National Fire Protection Association, NFPA 80: Standard for Fire Doors and Other Opening Protectives.
 - 3. ASTM International Standard Specifications referred to herein by ASTM numbers.

1.03 QUALITY ASSURANCE

- A. Single-Source Responsibility: Provide hollow metal doors and pressed steel frames by a single manufacturer's source with resources to provide products of consistent matching quality in appearance and physical properties.
- B. Supplier Qualifications: Qualified direct distributor of products to be furnished. The distributor shall have in their regular employment an A.H.C./C.D.C. or person of equivalent experience who will be available at reasonable times to consult with the Architect, Contractor and/or Owner regarding any matters affecting the total door and frame openings.
- C. General Installer Qualifications: Experience with installation of similar materials as specified herein.

1.04 SUBMITTALS

- A. General: Submit Shop Drawings, Product Data and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein. Indicate general construction, configurations, jointing methods, reinforcements, gauges and finishes, conduits, and location of hardware and cutouts for glass and louvers.
- B. Shop Drawings: Prepare and submit complete Shop Drawings, including Door and Frame Schedule, for the following:
 - 1. Pressed Steel Door and Window Frames.
 - 2. Hollow Metal Doors.
 - 3. Accessory Items, as required.
- C. Product Data: Indicate frame configurations, and finishes of prefinished frames.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver all materials to the site in manufacturer's protective cartons, crates and wrappings clearly labeled and intact with pertinent information to facilitate checking. Unload in areas designated by the General Contractor. Handle hollow metal products with care to prevent damage.
- B. Storage: Store materials at the site off the ground in properly protected dry storage facilities, until ready for use.
 - 1. Door Storage: Store doors in upright position, under cover. Place doors on at least 4 inch high wood sills or on floors in manner that will prevent rust and damage. Do not use non-vented plastic or canvas shelters which create humidity chamber and promote rusting. If corrugated wrapper on door becomes wet, or moisture appears, remove wrapping immediately. Provide 1/4 inch space between doors to promote air circulation.
 - 2. Frame Storage: Store frames under cover on 4 inch wood sills on floors in manner that will prevent rust and damage. Do not use non-vented plastic or canvas shelters which create humidity chamber and promote rusting. Store assembled frames in vertical position, five (5) units maximum in stack. Provide 1/4 inch space between frames to promote air circulation.

1.06 PROJECT CONDITIONS

- A. Field Measurements: Verify actual measurements/openings by field measurement prior to fabrication.

- B. Coordination: Contractor shall coordinate the Work with frame opening construction, door and hardware installation.

1.07 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

PART 2 - PRODUCTS

2.01 HOLLOW METAL DOOR AND FRAME MANUFACTURERS

- A. Manufacturers: Furnish steel doors and frames by one of the following manufacturers.
 1. Ceco Door (ASSA ABLOY Group), 9159 Telecom Drive, Milan, TN 38358, (888)232-6366 or (731)686-8345; www.cecodoor.com.
 2. Curries Company (ASSA ABLOY Group), 1502 12th Street, N.W., Mason City, IA 50401, (641)423-1334 or (800)377-3948; www.curries.com.
 3. Steelcraft®, ALLEGION™ (formerly Ingersoll-Rand Security Technologies), 11819 N. Pennsylvania Street, Carmel, IN 46032, (877)578-1247; <http://us.allegion.com/brands/steelcraft/pages/default.aspx>.
- B. Comparable Products: Hollow metal door and frame by other manufacturers with comparable equivalent products, may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.

2.02 MODIFICATIONS

- A. Modify standard door and frame products to size, type and style as required to conform to the requirements of this Specification and/or the Drawings.

2.03 QUALITY OF WORK

- A. Fabrication: All items shall be fabricated in accordance with the requirements of the Steel Door Institute (SDI), "SDI 100 Recommended Specifications for Standard Steel Doors and Frames - ANSI/SDI A250.8-2003", the best modern practices, the details and dimensions shown on the Drawings, approved Shop Drawings, and as specified herein.
- B. Face Joints: Joints shall be mitered, with cutting, forming and mitering done to hairline measurements; exposed joints shall be made smooth and invisible; and the fabrication shall be by welding wherever possible.
- C. Thickness of Steel: Provide strong and rigid construction with smooth and level finished surfaces that will remain so. Thickness of steel shall not be less than the U.S. Standard gauge thicknesses specified herein.
- D. Fire Ratings: Doors and frames in openings noted on the Drawings and/or Specifications shall bear the Underwriter's Laboratories label for fire rating indicated, and tested in accordance with NFPA 252 - Standard Methods of Fire Tests of Door Assemblies, 2008 Edition or UL 10C. Construction shall be modified as required by the U.L. Label.

2.04 PRESSED STEEL DOOR FRAMES

- A. Fabrication: Frames shall be fabricated of commercial grade steel. Frames shall be of the factory welded unit type combining bucks and jambs, of the dimensions and profiles shown on the Drawings. Frames shall form true rectangular openings, and shall have all corners mitered, fully welded and ground smooth. Frames for interior door openings shall be fabricated of cold rolled steel conforming to ASTM Standard A1008. Frames for exterior door openings shall be fabricated of hot-dip galvanized steel sheets, ASTM Standard A653 (formerly ASTM Standard A526) with ASTM Standard A924, A60 or G60 zinc coating, mill phosphatized. Knock-down frames for exterior doors are prohibited.
1. Gauge Thickness: Provide not less than the following gauges.
 - a. 14 gauge for exterior door openings.
 - b. 16 gauge for interior door openings 4'-0" wide or less.
 - c. 14 gauge for interior door openings over 4'-0" wide.
 2. Exterior Frames: Door frames shall comply with NFPA 105: Standard for the Installation of Smoke Door Assemblies and other Opening Protectives; Underwriters Laboratories Inc®, Standard UL 1784 - Air Leakage Tests of Door Assemblies; and rate of air leakage shall be in accordance with ASTM Standard E283. Joints shall be die-mitered with integral tabs for reinforcement and inter-locking of the jambs to the head. Frames shall be set up and welded or (joints to be full saw mitered or saw butt end on high speed metal cutting saw and to be full welded). Welded frames corners shall be finished to a smooth surface. Frames shall be thoroughly degreased and cleaned of all imperfections before painting.
 3. High Frame Heads: Furnish special 4" high frame heads where required by Drawings.
 4. Hardware Preparation: Frames shall be mortised, reinforced, and drilled and tapped for mortise hardware. Frames shall be reinforced only for surface mounted hardware, with drilling and tapping to be done in the field by the erection Contractor. Provide metal plaster guards for all mortise cutouts. Unless otherwise noted on the Drawings; minimum requirements for hardware reinforcements are to be as follows: Hinge reinforcing - 7 Ga. x 1-5/8" x 10", lock strike reinforcing - 14 Ga. x template requirements, closer reinforcing - 12 Ga.
 5. Insulation: Exterior frame assemblies shall be insulated and comply with ASTM C1363 - Standard Test Method for the Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus.
- B. Floor Anchors and Supports: Provide frames with not less than 18 gauge thick galvanized sheet steel anchors for attachment to floor slab. For conditions which do not allow the use of floor anchors, provide additional support jamb anchors.
- C. Jamb Anchors: Provide quantity of wall anchors as specified herein, per jamb at hinge and strike locations.
1. Exterior Metal Framed Wall Installations: Welded, appropriate type, adjustable #16 gauge (minimum) steel anchors. Use galvanized items for units built into exterior walls, complying with ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - a. Frames up to 7'-6" high - 4 anchors.
 - b. Frames 7'-6" to 8'-0" high - 5 anchors.

2. Masonry Wall Installations: Welded, tee type, adjustable #16 gauge (minimum) steel anchors, corrugated, not less than 2" x 10". Use galvanized items for units built into exterior walls, complying with ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - c. Frames up to 7'-6" high - 3 anchors.
 - d. Frames 7'-6" to 8'-0" high - 4 anchors.
3. Metal Stud Partition Installations: Standard, #18 gauge (minimum) steel anchors, securely welded inside each jamb.
 - a. Frames up to 7'-6" high - 4 anchors.
 - b. Frames 7'-6" to 8'-0" high - 5 anchors.
- D. Door Silencers/Rubber Bumpers: Provide a minimum of three (3) solid rubber bumpers on face of stop at strike jambs of single door frames, and not less than two (2) solid rubber bumpers on heads of double door frames.
- E. Fire-Rated Labeled Door Frames: Fire rated metal door frames shall bear the same label as required by the respective door. Refer to Door and Frame Schedule as noted on the Drawings for U.L. fire rating.
- F. Reinforcing Plates: Provide 12 gauge (unless otherwise noted) continuous steel reinforcing plates in pressed steel frames as required for "traffic/impact doors", indicated on the Drawings.
- G. Special Conditions for Electrified Hardware: Provide where required by the Drawings; ElectroLynx® Plug-In Connector System from one of the ASSA ABLOY Group brand door and frame manufacturing companies as specified herein. System shall provide fully enclosed pressed steel cover boxes spot welded to the frames for power transfer, power transfer hinges, door status switches, and electromagnetic locks. Each cover box to be equipped with conduit containing wiring harness with ElectroLynx™ connectors at the hinge end and a bare wire end in a junction box at the head of the frame for standard connection to the building wiring. Prepare frames in shop for openings listed to be equipped with door position switches by drilling a 1 inch diameter hole in the head of the frame to line up with the magnet hole in the top of the corresponding door. Provide a 1-1/4 inch deep backbox in the frame above the switch hole.

2.05 PRESSED STEEL WINDOW FRAMES

- A. Frames shall be fabricated of 16 gauge, commercial quality, cold-rolled carbon steel sheet complying with ASTM Standard A1008, with mitered or coped corners knocked-down for field assembly. Each head and sill member shall include two (2) adjustable anchors 6" from each end, cut to length glazing heads, and attaching screws. Components shall receive manufacturer's standard phosphatized pretreatment and baked-on prime paint finish.

2.06 HOLLOW METAL DOORS

- A. Fabrication: Doors shall be fabricated of commercial quality steel, and free of scale, pitting or other surface defects. Doors shall be of flush slab type and of sizes indicated on the Drawings. Doors shall be fabricated of level, cold-rolled steel conforming to ASTM Standard A1008. Face sheets for exterior doors shall be fabricated of galvanized steel sheets, ASTM Standard A653 (formerly ASTM Standard A526) with ASTM Standard A924, A60 or G60 zinc coating, mill phosphatized.

1. Face Sheet Gauge Thickness: Provide not less than the following gauges.
 - a. Exterior doors, 16 gauge.
 - b. Interior doors, 16 gauge.
- B. Door Faces and Edges: Door faces shall be of single sheets, turned over reinforcing channels at perimeter and at openings, and internally reinforced. All four edges of the doors shall be closed and flush. Surfaces shall be flat, true and rigid, without visible seams or joints.
- C. Astragals: Pairs of doors shall be furnished with astragals as required. Doors equipped with exit devices shall not be provided with astragals.
- D. Fire-Rated Labeled Doors: Steel stiffened core as required by Underwriters Laboratories. Build in special hardware and provide two piece overlapping astragals as required. At one hour and at 1-1/2 hour fire-rated doors at enclosures, maximum transmitted temperature end point shall not exceed 450 degrees F above ambient at end of 30 minutes of fire exposure specified in U.B.C. Standard No. 43-2.
- E. Glazed Openings: Where doors have glazed openings, provide integral rabbeted openings to receive glass, and loose molded metal stops secured by small oval head matching countersunk screws. Provide trim as required for fire-rated glazings.
- F. Louvers: Where doors have louvers, provide sightproof stationary door louvers of sizes noted on the Drawings. Louvers shall have a minimum of 50% free area, constructed of inverted V-shaped or Y-shaped blades formed of 24 gauge (min.) cold-rolled steel set into 20 gauge (min.) steel frame. Louvers shall be factory installed with one-way, non-removable screws.
- G. Insulated Exterior Doors: All exterior doors shall contain non-combustible foamed-in-place polyurethane core. "R" Factor shall be not less than 11.01. Insulating material shall be solidly packed full door height to fill voids between inner core reinforcing members to fully insulate door. Door assemblies shall comply with ASTM Standard C518 and ASTM Standard C1363.
- H. Sound Interior Doors: All interior doors shall be completely filled with rigid urethane core formed in place and chemically bonded to all interior surfaces.
- I. Electrified Hardware: Provide where required by the Drawings; ElectroLynx® Plug-In Connector System from one of the ASSA ABLOY Group brand door and frame manufacturing companies as specified herein. System shall provide doors to receive electro-mechanical function hardware with integral wire harness consisting of 12 conductors of 22 gauge wire in PVC jacket complete with ElectroLynx™ quick connect system to match electrified hardware. Prepare doors in shop for openings listed to be equipped with door position switches by drilling a 1 inch diameter, 1-5/8 inch deep hole in the top of the door, on centerline of the thickness of the door, 6 inches from the strike side of the door.

2.07 FINISHING

- A. Cleaning and Shop Priming: Steel frame and door surfaces shall be thoroughly degreased and cleaned of mill scale, abrasions, rust, oil, grease, dirt, and other foreign materials, and provided with Bonderite® solution to phosphatize all metal surfaces prior to finishing. Shop prime painting shall include inaccessible surfaces such as inside surfaces of frames, and doors with rust-inhibitive paint before assembly. Shop prime for all exposed surfaces shall either by air-drying or baking, and shall be suitable as a base for specified finish paints.
- B. Prime Painting: Provide manufacturer's standard, factory/shop applied coat of rust-inhibitive primer paint to all exposed surfaces of metal Work. Make all surfaces flush and smooth, and fill all irregularities with one or more coats of mineral filler; and apply another coat of suitable primer. Sand smooth between coats and separately bake-on each coat.

2.08 HARDWARE PREPARATION

- A. General: Cut-out, drill, tap, countersink, reinforce and prepare doors and door frames as required to receive all finish hardware, including mortised and concealed hardware. Countersink all butts, strikes and locksets to be flush. Close countersink areas with reinforcing for butts and strikes. Unless otherwise specified and/or noted on the Drawings, reinforcing shall be #7 gauge (minimum) for hinges, #12 gauge for universal strikes, #16 gauge for lock and latch sets, and #12 gauge (minimum) for closers. Weld all reinforcing plates to the interior of the frames or doors.
1. Hinge Jambs shall be mortised for template hinges and lock jambs shall be mortised for ANSI A115.1 and .2 universal lock strike.
 2. Plaster guards shall be snap in type.
 3. Hinge and strike reinforcements shall be drilled and tapped by the manufacturer.

PART 3 - EXECUTION

3.01 SHIPMENT

- A. Door Frames: Ship door frames with temporary spreaders across bottoms to maintain shape.

3.02 INSTALLATION

- A. Pressed Steel Door Frames - General:

1. Exterior and Interior Pressed Steel Frames:

- a. Door frames for interior and exterior installations shall be installed in accordance with approved Shop Drawings and manufacturer's installation instructions.
- b. Door frames shall be set accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, temporary braces and spreaders shall be removed, leaving surfaces smooth and undamaged.

- B. Hollow Metal Doors-General: Exterior and interior doors shall be hung to fit in the frames with minimum tolerance, to swing easily and quietly without touching the floor, and in full contact with frame stops when closed.

- C. Door Frames and Doors (Metal or Wood Stud Framing Construction): Hollow metal doors and pressed steel frames for installation within metal or wood stud framing construction shall be installed as part of Work within this section.

- D. Door Frames and Doors (Metal Framed Construction): Hollow metal doors and pressed steel frames for installation within metal framed construction shall be installed as part of Work within this section.

3.03 ADJUSTING AND CLEANING

- A. Adjustments: Doors shall be fully operable and adjusted for proper operation, free from binding or other defects.

- B. Cleaning: Clean and restore soiled surfaces.

1. Exterior doors shall be free from rust and any areas of surface rust shall be removed prior to being cleaned and primed.

- C. Prime Coat Touch-Up: Immediately after installation; sand smooth rusted or damaged areas of prime coat, and apply touch-up coat of compatible air-drying primer.
- D. Construction Scraps: Remove construction scraps and debris, and leave site in a clean condition.

END OF SECTION

SECTION 08 33 23OVERHEAD COILING DOORS

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, material, equipment apparatus, tools, transportation, protection, and services necessary for the proper execution and completion of all Overhead Coiling Door Work as indicated on the Drawings and specified herein.
- B. Door and Frame Schedule: Refer to the Drawings.
- C. Related Sections: The following related Work will be provided in other sections of the Specifications, as indicated:
 - 1. Masonry Work - Section 04 20 00.
 - 2. Cold - Formed Metal Framing - Section 05 40 00.
 - 3. Steel Framed Door Openings - Section 05 50 00.
 - 4. Joint Protection - Section 07 90 00.
 - 5. Finish Hardware - Section 08 70 00.
 - 6. Gypsum Wallboard - Section 09 29 00.
 - 7. Finish Field Painting - Section 09 91 13.
 - 8. Loading Dock Equipment - Section 11 13 00.
 - 9. Electrical Work - Division 26.

1.02 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Rolling steel doors shall be manufactured by a firm with a minimum of five (5) years experience in the fabrication and installation of rolling door(s).
- B. Wind Loading: All materials and systems shall meet local building code requirements in the State of the proposed Project, for fire spread, uplift resistance and wind loads.
- C. Installer Qualifications: Furnish written evidence when submitting a bid stating installer/representative is authorized by the door manufacturer to install the specified door(s).
- D. Single-Source Responsibility: Provide door(s) as a complete unit produced by one manufacturer, including motor(s), hardware, accessories, mounting and installation components.

1.03 SUBMITTALS

- A. General: Submit Shop Drawings and Product Data prior to fabrication, to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Shop Drawings: Prepare completely detailed Shop Drawings, showing all Work to be provided, including installation details. Include detailed plans, elevations, and details of framing members, required clearances, anchors, and accessories. Include relationship with adjacent materials.
 - 1. Shop and Erection Drawings: Include and indicate the following:
 - a. Dimensions, materials and gauges.
 - b. Material finishes.
 - c. Weatherstripping.
 - d. Hardware.
 - e. Insulation.
 - f. Vision Lites.
 - 2. Operation and Maintenance Manual/Data: Submit lubrication requirements and frequency, and periodic adjustments required.
- C. Product Data: Submit manufacturer's Product Data, and complete information describing door, guides, etc., and installation instructions for each type of door. Include both published data and any specific data prepared for this Project.

1.04 PRODUCT DELIVERY, HANDLING AND STORAGE

- A. Delivery: Deliver all products, materials, and accessories in labeled protective packages, at location designated by the General Contractor.
- B. Storage: Store and handle in strict compliance with manufacturer's instructions and recommendations. Whenever possible, store all products and materials at the site in secure interior locations. Handle all materials in a manner that will protect materials from damage from weather, excessive temperatures and construction operations. Do not place materials directly on ground.

1.05 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance of the installation.

PART 2 - PRODUCTS

2.01 MANUFACTURER AND MODEL

- A. Manufacturer: Overhead coiling door specified herein shall be as manufactured by Wayne Dalton, 2501 S. State Highway, 121 Business, Suite 200, Lewisville, TX 75067, (800)827-3667, www.wayne-dalton.com.
 - 1. Model: Prefinished Insulated Rolling Steel Doors, "Thermotite 800C".
 - 2. Terminal Building: Chain Hoist Operator.
 - 3. Maintenance and Truck Wash Buildings: Electric motor operator and vision lites.
- B. Comparable Products: Commercial heavy-duty overhead coiling doors by the following or other manufacturer with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.
 - 1. Cornell Iron Works, Inc., 24 Elmwood Avenue, Crestwood Industrial Park, Mountaintop, PA 18707, (800)233-8366; www.cornelliron.com.
 - 2. Overhead Door Corporation, 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067, (800)275-3290 or (469)549-7100.; www.overheaddoor.com.
 - 3. Raynor, 1101 East River Road, P.O. Box 448, Dixon, IL 61021-0448, (815)288-1431, www.raynor.com.
 - 4. Metro Door, LLC, 821 Industrial Drive, Lewisburg, TN 37091 (833)969-3667, www.metrodoor.com.

2.02 DOOR TYPE

- A. Rolling Steel Doors: Exterior commercial doors shall be interior face-of-wall mounted, overhead heavy-duty rolling steel service doors with insulation providing a U-Value of 0.13 and R-Value of not less than 7.7, of sizes indicated and required to close the openings.
- B. Door Operation: Chain hoist operator for doors shall be manual hand chain operation, reduction gear type with endless steel chain. Effort to operate shall not exceed maximum of 35 lbs. pull to operate door.
- C. Door Operation: Doors shall have electric motor operation, including emergency manual hand chain release operation, reduction gear type with endless steel chain. Effort to operate pull chain shall not exceed maximum of 35 lbs. pull to operate door.

2.03 MATERIALS AND FABRICATION

- A. Curtains: Fabricate door curtain from multiple, interlocking, roll-formed steel slats, to provide a curtain of sufficient strength and rigidity.
 - 1. Slats: Flat profile No. 34, insulated front slats, fabricated from not less than standard 22 gauge hot-dipped galvanized steel sheet conforming to ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy - Coated (Galvannealed) by the Hot-Dip Process, (formerly ASTM Standard A525). Back cover slats shall be not less than 24 gauge galvanized sheet steel. Slat cavity shall be fully filled with 2.2 lb. density CFC-free foamed-in-place polyurethane insulation.

2. Endlocks: Provide metal endlocks attached to each end of alternate curtain slats, to provide a wearing surface in the guides and to prevent lateral movement of the individual slats.
 3. Windload Design: Provide resistance of not less than 20 lbs./sq. ft. windload, and/or as required by local building code.
 4. Bottom Bar: Provide full width, two (2) roll-formed galvanized structural steel angles, prime painted, 1-1/2" x 1-1/2" x 1/8" thick (minimum) angles bolted back to back to reinforce the curtain in the guides, fastened to the bottom of the curtain.
- B. Vision Lites: Provide double wall polycarbonate Plexiglas® vision lites as shown on the Drawings.
- C. Guides: Fabricate guides from standard roll-formed galvanized structural steel angles not less than 3/16" thick. Bolt guides to steel jambs with not less than 3/8" diameter size bolts. Provide guides equipped with windlock bars as required and/or recommended by the door manufacturer, capable of resisting not less than 85 M.P.H. basic wind speed exposure, unless otherwise required by local building code.
- D. Bracket Plates: Fabricate brackets from not less than 1/4" thick heavy cast iron or hot-rolled galvanized steel plates to support counterbalance, curtain and hood. Brackets shall be designed to support the door shaft and form an end closure for the hood. Permanently lubricated sealed ball bearings shall support the counterbalance assembly. Bracket shall be reinforced with angles to which the hoods are to be fastened.
- E. Counterbalance Assembly: Provide counterbalance assembly with oil tempered steel helical torsion spring type design providing a 25% safety overload factor. Springs shall be fixed to tapered cast anchors, permanently lubricated, mounted on a single continuous solid torsion rod. Torsion rod shall be attached to spring tension wheel. Assembly shall be housed in a steel tube or pipe barrel shaft of adequate diameter and rigidity to support the curtain and limit deflection 0.03 inch per lineal foot of span width. Spring tension shall be adjustable by means of an adjusting tension wheel readily accessible on the outside of the bracket plate.
- F. Motor Operator: Provide UL Listed electric operator, size as recommended by manufacturer to move door in either direction at not less than 2/3 of a foot or more than 1 foot per second. Assembly shall include high starting torque, instant reversing, auto reset, thermal overload protected NEMA MG 1 motor with electrical characteristics to suit door size and service feed. Reversing contactor shall be electrically and mechanically interlocked, and adjustable limit switches shall be synchronized with door. Control circuit shall be 24 VAC.
1. Operator Controls: Push-button, interior located surface mounted control station(s) within NEMA 250 enclosure(s), with Open/Close/Stop push-buttons.
 2. Sensing Edge Protection: Provide pneumatic sensing edge.
- G. Motor Voltage: 115/230 single phase, 60 Hz, unless otherwise noted on the Drawings.

2.04 HOODS

- A. Fabricate hoods from not less than 24 gauge galvanized steel sheet with intermediate supports as required, formed flat to fit the contour of the end brackets in a neat manner and reinforced with stiffening rolls at top and bottom edges, as detailed on the Drawings.

2.05 FINISHES

- A. Curtain Slats and Hoods: Hot-dipped galvanized steel in accordance with ASTM Standard A653 and receive rust-inhibitive, roll coating process, including bonderizing (phosphate treatment), 0.2 mils thick

(minimum) factory shop applied baked-on “White”, prime coat of paint, and manufacturer’s 0.6
mils thick baked-on polyester (powder-coated) top coat.

1. Color(s): Prefinished powder coated finish doors shall be of color(s) as selected by the Architect and/or Owner.
- B. Non-Galvanized Ferrous Surfaces: All non-galvanized exposed, ferrous surfaces shall receive one (1) coat of manufacturer’s standard factory applied rust-inhibitive primer.

2.06 WEATHERSTRIPPING

- A. Perimeter Seal: Weatherseals shall include exterior guides and the following:
 1. Bottom bars shall have a full width bulbular neoprene synthetic rubber or vinyl bottom weatherseal to provide a positive seal.
 2. Guides shall be weatherstripped with a vinyl weatherseal at each jamb, on the exterior curtain side.
 3. Hoods shall be provided with full width internal hood baffle weatherseal and full width lintel weatherseal.

2.07 LOCKING HARDWARE

- A. Chain-Hoist Manual Operation: Doors shall have chain keeper locks brackets, suitable for padlocks. Provide interior bottom bar slide bolt locks at each jamb for padlocks. Padlocks will be provided by others.
- B. Electric Motor Operated Doors: Doors shall lock through operator gearing, and shall include the following:
 1. Interior slide bolt lock for electric operation with interlock switch.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Contractor shall obtain field dimensions and examine conditions of substrates, supports, and other conditions under which this Work is to be performed. Do not proceed with Work until unsatisfactory conditions are corrected.

3.02 FABRICATION

- A. Fabricate service door(s) in strict accordance with the approved Shop Drawings.

3.03 INSTALLATION

- A. General: The authorized installer shall mount, erect and install door(s) and all accessories strictly complying with the door manufacturer’s written installation instructions and recommendations. Do all drilling, tapping, and cutting as required for the complete installation. Secure all parts in place in a rigid manner. Clip angles for door guides shall be bolted or welded to the steel jambs, spaced as required by Shop Drawings. Coordinate installation with adjacent Work to ensure proper clearances and allow for maintenance.

1. Install service door(s) in strict accordance with the original design, all pertinent codes and regulations, the approved Shop Drawings, and anchoring all components firmly in place for long life under hard use.
- B. Steel Framing: Steel framing will be furnished only to the extent shown on the Drawings. Contractor shall furnish and install all other framing not provided by others as required to mount the door(s).
- C. Hoods: Install hood baffle directly to the inside face of the masonry wall, and caulked and sealed as specified herein.
- D. Caulking and Sealing: Coordinate installation of sealants and backing materials at hood baffle and around entire perimeter as specified in Specification Section 07 90 00.
- E. Completion of Installations: Upon completion of installations, including Work by other trades; lubricate, test for proper operation and adjust doors to operate easily under all conditions, free from warp, twist, binding or distortion. Doors shall be weathertight and fit tight to sill and jambs along the entire perimeter of the opening.

3.04 TOUCH-UP AND CLEANING

- A. Damaged Finishes/Coatings: Touch-up all scuffs, abrasions, and damaged shop finish coatings with finishes as specified herein; and repair minor damage. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer of material or product being cleaned.
- B. Labels and Markings: Remove all temporary labels and visible markings.

3.05 INSTRUCTIONS FOR OPERATION

- A. Overhead Coiling Door Instructions: Upon completion of the installations, and as a condition of its acceptance; furnish all written information to the Owner necessary for proper operation of the door equipment, and provide instruction to Owner and/or Tenant maintenance personnel in proper overhead coiling door operating procedures and maintenance schedule.

END OF SECTION

SECTION 08 41 00ENTRANCES AND STOREFRONTS

The requirements of the "General Conditions", the "Supplementary Conditions", and "Division 1" sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, equipment, apparatus, tools, transportation, protection, and services necessary for Aluminum Work indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:
1. Aluminum Frames, Receiver Channels, Plates, Angles, Sill Flashings, Wood Shims, Fasteners and Reinforcing.
 2. Components, Accessories and Adapters.
 3. Swinging Aluminum/Glass Entrance Doors and Frames.
 4. Caulking or Sealing Aluminum to Aluminum.
 5. Resilient Closure Gaskets at Aluminum Work.
 6. Finish Hardware for Doors.
 7. Cleaning Aluminum Assemblies.
- B. Door and Frame Schedule: Refer to the Drawings.
- C. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:
1. Cast-In-Place Concrete - Section 03 30 00.
 2. Masonry Work - Section 04 20 00.
 3. Cold-Formed Metal Framing - Section 05 40 00.
 4. Miscellaneous Metal Work - Section 05 50 00.
 5. Rough Carpentry Work - Section 06 10 00.
 6. Thermal Insulation - Section 07 21 00.
 7. Exterior Insulation and Finish System - Section 07 24 00.
 8. Sheet Metal Work - Section 07 60 00.
 9. Joint Protection - Section 07 90 00.
 10. Finish Hardware - Section 08 70 00.
 11. Glazing - Section 08 80 00.
 12. Gypsum Wallboard Construction - Section 09 29 00.

1.02 APPLICABLE STANDARDS AND SPECIFICATIONS

- A. General: Except as otherwise specified herein, materials and Work shall conform to the current editions of the following standards and specifications. Contractor shall obtain copies of the following standards and specifications for reference, and keep at the Project field office.
1. ASTM International Standard Specifications referred to herein by number.
 2. American National Standards Institute (ANSI) and Builders Hardware Manufacturers Association (BHMA), ANSI/BHMA A156.10 - Power Operated Pedestrian Doors.
 3. American Welding Society (AWS).
 4. American Architectural Manufacturers Association (AAMA), Aluminum Storefront and Entrance Manual.
- B. Requirements of Regulatory Agencies: Furnish and install all doors in strict compliance with the laws, codes, ordinances and regulations of the public authorities having jurisdiction over this Project, including Title III of The Americans With Disabilities Act (ADA), Public Law 101-336.
- C. Door Hardware: Provide door hardware in compliance with the Indiana Building Code which includes, but is not necessarily limited to the following:
1. Door handles, pulls, latches, locks and other operating devices shall be at a maximum height of 48 inches (1219 mm) above the finished floor. The operating devices shall be capable of operation with one hand and shall not require tight grasping, tight pinching or twisting of the wrist to operate. All means of egress doors shall be of a side-swinging type. All doors shall swing in the direction of egress where serving an occupant load of 50 or more persons or where serving a high-hazard occupancy. The opening force for interior side-swinging doors without closers shall not exceed a 5-pound (22 N) force. For all other side-swinging, sliding and folding doors, the door latch shall release when subjected to a 15-pound (66 N) force. The door shall be set in motion when subjected to a 30-pound (132 N) force. The door shall swing to a full-open position when subjected to a 15-pound (66 N) force. Forces shall be applied to the latch side.

1.03 SYSTEM DESCRIPTION

- A. Storefront System Performance Requirements:
1. Wind Loads: Storefront systems shall meet local building code requirements for wind loads.
 2. Air Infiltration: The test specimen shall be tested in accordance with ASTM Standard E283. Air infiltration rate shall not exceed 0.06 cfm/ft² (0.3 l/s · m²) at a static air pressure differential of 6.24 psf (300 Pa).
 3. Water Resistance: The test specimen shall be tested in accordance with ASTM Standard E331. There shall be no leakage at a minimum static air pressure differential of 8 psf (383 Pa) as defined in AAMA 501.
 4. Uniform Load: A minimum static air design load of 35 psf (1680 Pa) shall be applied in the positive and negative direction in accordance with ASTM Standard E330. There shall be no deflection in excess of L/175 of the span of any framing member at design load. At structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.

5. Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than:
 - a. Glass to Exterior: 0.47 (low-e) or 0.61 (clear).
 - b. Glass to Center: 0.44 (low-e) or 0.61 (clear).
 - c. Glass to Interior: 0.41 (low-e) or 0.56 (clear).
6. Condensation Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than:
 - d. Glass to Exterior: 70_{frame} and 69_{glass} (low-e) or 69_{frame} and 58_{glass} (clear).
 - e. Glass to Center: 62_{frame} and 68_{glass} (low-e) or 63_{frame} and 56_{glass} (clear).
 - f. Glass to Exterior: 56_{frame} and 67_{glass} (low-e) or 54_{frame} and 58_{glass} (clear).
7. Sound Transmission Loss: When tested to ASTM Standard E90 and ASTM Standard E1425, the Sound Transmission Class (STC) and Outdoor/Indoor Transmission Class (OITC) shall not be less than:
 - g. Glass to Exterior: 38 (STC) and 31 (OITC).
 - h. Glass to Center: 37 (STC) and 30 (OITC).
 - i. Glass to Exterior: 38 (STC) and 30 (OITC).

1.04 QUALITY ASSURANCE

- A. General: All materials, articles, and accessories incorporated in the Work shall be of type and quality specified herein, and shall be subject to the Architect's review. Methods of preparation, construction and installation shall be in accordance with approved Shop Drawings, manufacturer's printed specifications, the Architect's Drawings and Specifications, and as directed by the Architect.
- B. Installer's Qualifications: Entrances and Aluminum Framing Work shall be installed by a firm with not less than five (5) years successful experience in the installation of the indicated and specified systems.
- C. Environmental Requirements: Paint products such as isolation coatings shall comply with all applicable Federal and State Regulations on Volatile Organic Compounds (VOC).

1.05 SOURCE QUALITY CONTROL

- A. Single-Source Responsibility: Provide aluminum frame entrances and storefronts as specified herein from one source from a single manufacturer.

1.06 SUBMITTALS

- A. General: Submit Shop Drawings, Product Data, Compatibility Reports, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Shop Drawings: Prepare and submit complete Shop Drawings showing of all items, including but not necessarily limited to the following.
 1. Aluminum Framing Members.
 2. Aluminum/Glass Entrance Doors.

3. Finish Hardware.
 4. Aluminum Trim Break Metal.
- C. Color Samples: Submit two (2) 4" x 4" Samples of each aluminum finish specified herein.
- D. Test Reports: Submit certified test reports showing compliance with performance characteristics as specified herein.

1.07 MATERIAL DELIVERY AND STORAGE

- A. Delivery: All materials shall be delivered to the site in protective crates and wrappings clearly labeled with pertinent information to facilitate checking. Unload in areas designated by the General Contractor.
- B. Storage: Materials shall be stored at the site, off the ground and in protected dry storage facilities, until ready for use.

1.08 WARRANTY

- A. Form of Warranty: Furnish a warranty, in the approved written form, warranting all Work against defective materials and workmanship for a period of not less than one (1) year from the date of Owner's acceptance of installation.
- B. Finishes: Include and provide the following warranties.
1. Anodized Finishes: The aluminum frame manufacturer shall provide not less than a two (2) year warranty period stating that the finished products shall be free from material defects in materials and workmanship. Warranty period shall commence from date of shipment of the products from the manufacturer's factory.

PART 2 - PRODUCTS

2.01 ALUMINUM FRAMING MANUFACTURERS

- A. Manufacturer: Aluminum framing products specified herein shall be such as manufactured by Kawneer Company, Inc., Technology Park/Atlanta, 555 Guthridge Court, Norcross, GA 30092, (770)449-5555; www.kawneer.com.
- B. Comparable Manufacturers and Products: Aluminum framing by the following manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.
1. Tubelite, Inc., 3056 Walker Ridge Drive NW, Suite G, Walker, MI 49544, (800)866-2227; www.tubeliteinc.com.
 2. United States Aluminum, Commercial Products Group, 200 Singleton Drive, Waxahachie, TX 75165, (972)937-9651 or (800)627-6440; www.usalum.com.
 3. YKK AP America Inc., 270 Riverside Parkway, Suite 100, Austell, GA 30168, (678)838-6000, www.ykkap.com.

2.02 MATERIALS/PRODUCTS

A. Aluminum (Framing and Components):

1. Material Standard: ASTM B221 - Standard Specification for Aluminum and Aluminum - Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 6063-T6 Aluminum alloy and tempered.
2. Member Wall Thickness: Each framing member shall provide structural strength to meet specified performance requirements.
3. Extruded and Sheet Aluminum: All extruded and sheet aluminum, unless otherwise specified or noted on the Drawings shall have a minimum thickness of 1/8", and greater thickness where required for proper stiffness or rigidity.
4. Aluminum Moldings: All aluminum moldings not designated by number shall be of thickness as indicated, and, if not indicated, shall be a minimum of .050" thick, with finish as specified for other aluminum members.
5. Fabrication: Generally, fabrication shall be accomplished without exposed screws or fasteners. Provide cap plates on vertical mullions where noted on the Drawings.

B. Aluminum Finishes and Locations:

1. Color Anodized Finish: Aluminum Association Specification AA-M10C22A44 to match Kawneer Company, Inc., "Permanodic™" Architectural Class I color "Dark Bronze No. 40" as noted on the Drawings. at locations as specified herein.
 - a. Finish Quality: All exposed surfaces shall be uniform in color, and shall be free from scratches, streaks, discoloration, die marks, and other imperfections. The finishes shall match the accepted samples. Color anodized finishes shall have a maximum color shade variation of any surface of 3 Delta E. No dyes or coatings shall be used to produce color anodized finishes.
 - b. Locations: Color shall be as noted on the Drawings.
 - 1) Aluminum Window Framing.
 - 2) Swinging Aluminum/Glass Entrance Doors.

- C. Manufacturer Trademarks: No manufacturer trademarks (applied plates, stickers, transfers, or painted) shall be placed on exposed surfaces of Aluminum Work. The "exposed surfaces" of aluminum doors are identified as surfaces exposed to view when doors are in closed position.

- D. Aluminum Sash, Tubes, Molding, Closures, Clips, and Locations: Provide aluminum framing as specified herein.

1. 2" x 4-1/2" Aluminum Framing Members (for 1" Thick Insulating Glass): Extruded aluminum sections prepared for center glazing from the exterior on all sides without projecting stops. Provide internal reinforcing with steel shapes. Manufacturers: Kawneer; www.kawneer.com, "Trifab® VG (VersaGlaze®) 451T" or comparable aluminum framing manufacturer as specified herein with equivalent products subject to review by the Architect.
 - a. Exterior Locations: Aluminum Window Framing.

2. Fabrication: Unless otherwise detailed, fabricate frames with full height, single piece verticals, with horizontals in single pieces cut-in between verticals. Verticals not anchored at side to masonry or concrete shall be of sufficient strength to limit deflection to L/175 of span under wind load as specified herein, or as required by local codes, internally reinforced with steel shapes if required. Reinforce horizontal members according to the recommendations of the aluminum frame manufacturer.
3. Comparable Products: Aluminum framing products by the other manufacturers specified herein with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.
4. 1-3/4" x 4-1/2" Aluminum Framing Members (for 1/4" Thick Glass): Extruded aluminum sections prepared for center glazing from the exterior on all sides without projecting stops. Manufacturers: Kawneer; www.kawneer.com, "Trifab® VG (VersaGlaze®) 450" or Special-Lite, Inc.; www.special-lite.com "SL-450".
 - a. Interior Locations: Aluminum Window Framing.

E. Swinging Aluminum/Glass Entrance Doors:

1. Door Design: Wide Stile Design, with extruded aluminum stiles and rails. Major portion of door stiles and rails shall be not less than .125 inch in thickness, and glazing mouldings shall be not less than .050 inches thick. Doors shall be of types and sizes indicated on Drawings, by one of the following manufacturers specified herein.
2. Entrance Door Stile and Manufacturer:
 - a. 500 Wide Standard Stile Entrances, such as manufactured by Kawneer Company, Inc., Technology Park/Atlanta, 555 Guthridge Court, Norcross, GA 30092, (770)449-5555; www.kawneer.com.
3. Comparable Products and Manufacturers: Entrance doors by the following manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.
 - a. Wide Stile Entrances, as manufactured by Tubelite, Inc., 3056 Walker Ridge Drive NW, Walker, MI 49544, (800)866-2227; www.tubeliteinc.com.
 - b. Series 550 Wide Stile, as manufactured by United States Aluminum, Commercial Products Group, 200 Singleton Drive, Waxahachie, TX 75165, (972)937-9651 or (800)627-6440; www.usalum.com.
 - c. 50D Wide Stile, as manufactured by YKK AP America, Inc., 270 Riverside Parkway, Suite 100, Austell, GA 30168, (678)838-6000, www.ykkap.com.
4. Bottom Rail: Manually operated, non-powered doors shall be provided with not less than 10" high bottom rails.
5. Reinforcement: Aluminum doors and frames shall be reinforced and fabricated to receive pivots or hinges (refer to Finish Hardware Schedule). Frames and doors shall include full height steel tube reinforcement. Reinforce doors to receive push-pull bars, with solid aluminum reinforcement welded in place within door stiles.
6. Door Clearance: Bottom door clearance shall be manufacturer's standard.

7. Weatherstripping: All doors shall have door manufacturer's standard weatherstripping on three sides.
8. Sweep Strip: Provide manufacturer's standard door EPDM blade gasket sweep strip with concealed fasteners at bottom of door.

F. Miscellaneous:

1. Building Felt: Type I, No. 15, unperforated asphalt-saturated organic roofing felt conforming to ASTM Standard D226.
2. Resilient Closure Gaskets: Provide one of the following flame and ultra-violet resistant products as manufactured by Williams Products, Inc., 1750 Maplelawn Blvd., Troy, MI 48084, (248)643-6400 or (800)521-9594; www.williamsproducts.net.
 - a. "Williams-Everlastic® EPDM Sponge 3000 Series", black or gray, closed-cell, EPDM sponge rubber, conforming to ASTM Standard D1056; 2A1, oversized to compress 25% when installed.
 - b. "Williams-Everlastic® EVA-200G", black or gray, cross-linked, closed-cell, ethylene/vinyl/acetate foam, conforming to ASTM Standard D1056; 2A1, oversized to compress 25% when installed.

2.03 FINISH HARDWARE

- A. Cylinders for doors will be furnished by Finish Hardware Contractor to the Aluminum Work Contractor for installation.
- B. Provide all other finish hardware for aluminum and glass entrance doors, and as specified in the Finish Hardware Schedule specified on the Drawings and the requirements within Section 08 70 00.
- C. Finish of finish hardware shall match finish of doors unless otherwise noted.

PART 3 - EXECUTION

3.01 FIELD MEASUREMENTS

- A. Contractor shall obtain field measurements of adjoining Work as required to locate and fit the Work of this section. Contractor shall be responsible for the accurate fitting of the materials together and to the building(s).

3.02 INSTALLATION

- A. General: Workmanship, methods, procedures and finish quality shall conform to the manufacturer's printed specifications, approved Shop Drawings, and shall be subject to review by the Architect.
- B. Isolation Coatings: Paint product specified herein shall be such as manufactured by The Sherwin Williams® Company, Cleveland, OH, (800)321-8194 or (800)474-3794; www.sherwin-williams.com, or comparable manufacturer's equivalent products subject to review by the Architect. Provide the following:
 1. Aluminum Contact With Steel: Wherever aluminum items are to be secured to, or in contact with steel supporting members, paint the contact surface of the steel with the following self-priming paint product for both the surfaces of the steel supporting members and the aluminum.

- a. Two (2) Coats: Macropoxy® 646 Fast Cure Epoxy, B58.
- 2. Aluminum Contact With Masonry or Concrete: Wherever aluminum items are to be secured to or in contact with masonry or concrete, paint the aluminum contact surface with the following self-priming paint product.
 - a. Two (2) Coats: Macropoxy® 646 Fast Cure Epoxy, B58.
- 3. Finish Surfaces: Allow all paint coats to dry thoroughly prior to installation of Aluminum Work. Exposed to view surfaces shall be clean and free of isolation coatings.
- C. Workmanship: All shop and field Work shall be done by skilled tradesman thoroughly experienced in this type of Work. Workmanship shall be of recognized high quality; and shall be first class in every respect, in accordance with the best, modern practice.
- D. Assembly: Insofar as possible, assemble the Work with concealed fastening. When exposed fastening cannot be avoided, heads of screws, rivets or bolts shall be of finish to match the color and texture of adjoining Work. Countersink all such fasteners flush.
- E. Erection: Erect all verticals in a plumb position; horizontals level; and the entire entrance assemblies to form true plumb planes, and true rectangular openings. Secure the frames into the openings with fasteners concealed by the glazing. Provide all frames with means for expansion and contraction of aluminum over a 100°F. temperature variation without bending, bowing, buckling or other damage to same. Allow sufficient space between the frame and surface that frame is anchored to, for installing sealant. Secure internal steel reinforcing, of tube framing, rigidly to building construction at top and bottom. NOTE: At top connections, of internal reinforcing to steel building framing, connections shall be sliding connections allowing only lateral (left and right) movement of the Entrance Work.
- F. Welding Technique: Welding shall be done by the argon shielded arc method in accordance with the recommendations of the American Welding Society (AWS); all welded joints shall be free from porosity, cracks, holes or other imperfections. Where exposed, finish welds to match adjacent surfaces.
- G. Fabrication and Fitting: Fabricate frames so when field assembled, components will be accurately fitted and securely joined to make tightly closed joints. Accurately fit doors in frames, to operate easily and quietly.
- H. Resilient Closure Gaskets: Install specified gasket material required as shown in conjunction with Work of this section and as indicated on the Drawings, for applications such as gasket for interior partitions butting into exterior glass and aluminum framing members.

3.03 ALUMINUM/GLASS DOOR HARDWARE

- A. Preparation: Prepare doors and frames to receive Finish Hardware, including cylinders. Cylinders shall be furnished by the Finish Hardware Contractor and all other Finish Hardware shall be provided by this Contractor.
- B. Installation: Install finish hardware, including cylinder locks.
- C. Checking and Adjusting: Check and adjust as required, all items of operating hardware.
- D. Finish Hardware Schedule: Refer to Section 08 70 00 - Finish Hardware. and the Drawings.

3.04 CLEAN-UP

- A. When the building is completed, thoroughly clean and polish all aluminum in accordance with the directions of the manufacturer, and leave in a satisfactory condition.
- B. Clean-up all Work soiled in the performance of Work under this section.
- C. During progress of the Work keep the premises free of all debris and waste materials resulting from the Work of this section. During progress of the Work, upon completion of Work, and before final acceptance of the Work, remove all scrap, construction debris and rubbish from the site, and dispose of legally. Upon completion and before final acceptance of the Work, remove all unused materials, tools, and equipment from the site.

END OF SECTION

SECTION 08 56 19PASS-THRU WINDOWS

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, equipment, apparatus, tools, transportation, protection, and services necessary for Pass-Thru Window Work as indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:
1. Flush-Mount Pass-Thru Window(s).
 2. Shingle Type Shims, and Fasteners.
 3. Caulking and/or Sealing.
 4. Cleaning Aluminum Finish.
- B. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:
1. Masonry Work - Section 04 20 00.
 2. Rough Carpentry Work - Section 06 10 00.
 3. Joint Protection - Section 07 90 00.
 4. Hollow Metal Doors and Frames - Section 08 11 13.
 5. Non-Structural Metal Stud Framing - Section 09 22 16.
 6. Gypsum Wallboard - Section 09 29 00.

1.02 APPLICABLE STANDARDS AND SPECIFICATIONS

- A. General: Except as otherwise specified herein, materials and Work shall conform to the current editions of the following standards and specifications. Contractor shall obtain copies of the following standards and specifications for reference, and keep at the Project field office.
1. ASTM A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 2. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 3. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 4. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 5. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.

- B. Requirements of Regulatory Agencies: Furnish and install all Pass-Thru Window(s) in strict compliance with the laws, codes, ordinances and regulations of the public authorities having jurisdiction over this Project, including Title III of The Americans With Disabilities Act (ADA), Public Law 101-336.

1.03 QUALITY ASSURANCE

- A. General: All materials, articles, and accessories incorporated in the Work shall be of type and quality specified herein, and shall be subject to the Architect's review. Methods of preparation, construction and installation shall be in accordance with approved Shop Drawings, manufacturer's printed specifications, the Architect's Drawings and Specifications, and as directed by the Architect.
- B. Manufacturer's Qualifications: Minimum of twenty-five (25) years successful experience continuously manufacturing pass-thru windows.
- C. Installer's Qualifications: Pass-Thru Window Work shall be installed by a firm with not less than five (5) years successful experience in the installation of the indicated and specified product.

1.04 SUBMITTALS

- A. General: Submit Shop Drawings, Product Data, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Shop Drawings: Submit complete Shop Drawings showing of all items, including plans, elevations, sections, and details, indicating dimensions, tolerances, materials, fabrication, glazing, fasteners, hardware, finish, electrical wiring diagrams where/if required, options, and accessories.
- C. Product Data: Submit manufacturer's product data, including materials, components, fabrication, finish, and installation instructions.
- D. Color Samples: Submit two (2) 4" x 4" Samples of aluminum finish as specified herein.
- E. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.
- F. Operation and Maintenance Manual: Submit manufacturer's operation and maintenance manual, including operation, maintenance, adjustment, and cleaning instructions, troubleshooting guide, parts list, and electrical wiring diagrams where/if required.
- G. Warranty: Submit manufacturer's standard warranty.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery: All materials shall be delivered to the site in manufacturer's original unopened containers and packaging, protective crates and wrappings clearly labeled with pertinent information identifying product name and manufacturer. Unload in areas designated by the General Contractor.
- B. Storage: Materials shall be stored at the site, off the ground and in protected in clean, dry area storage facilities, in accordance with the manufacturer's instructions.
- C. Handling: Protect materials and finish from damage during handling and installation.

1.06 WARRANTY

- A. Form of Warranty: Furnish a warranty, in the approved written form, warranting all Work against defective materials and workmanship for a period of not less than one (1) year from the date of Owner's acceptance of installation.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Manufacturer: Pass-Thru Window product specified herein shall be as manufactured by C.R. Laurence Company, (800)421-6144 Ext. 7760, www.crl-arch.com.

2.02 PASS-THRU WINDOW(S)

- A. Pass-Thru Window Design: Provide preassembled "Daisy" Pass-Thru Window.
1. Service Opening: Refer to Drawings.
 2. Door Operation: Manual operation.
 3. Door Type: Bi-parting, sliding, with two (2) door panels.
 4. Frame: Extruded aluminum, ASTM Standard B221, Alloy 6063-T6 and 6063-T52.
 5. Aluminum Sheet: ASTM Standard B209, Alloy 5005-AQ-H34.
 6. Fasteners: Stainless steel rivets and hex-head zinc-plated self-threading machine screws.
 7. Handle:
 - a. Manual Operation: Provide handle on both panels.
 8. Glazing: Clear, 1/4-inch tempered glass, ASTM Standard C1048.
 9. Silicone Glazing Sealant: Dow Corning® 999A, color as required to match aluminum finish.
- B. Aluminum Finish and Color:
1. Contractor shall provide manufacturer's standard "Dark Bronze" anodized, AA-M10-C12-C22-A44 finish and color in accordance with the requirements of ASTM B580 - Standard Specification for Anodic Oxide Coatings on Aluminum.
- C. Fabrication: Each assembly shall be factory assembled and fully factory glazed.

PART 3 - EXECUTION

3.01 FIELD MEASUREMENTS

- A. Contractor shall obtain field measurements of adjoining Work as required to locate and fit the Work of this section. Contractor shall be responsible for the accurate fitting of the materials together and to the building(s).

3.02 EXAMINATION

- A. Examine area(s) to receive pass-thru window(s). Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.03 PREPARATION

- A. Ensure opening(s) to receive pass-thru window(s) is plumb, level, square, accurately aligned, correctly located, and in tolerance.

3.04 INSTALLATION

- A. General: Workmanship, methods, procedures and finish quality for installation of pass-thru window(s) shall conform to the manufacturer's printed instructions and/or specifications, approved Shop Drawings, and shall be subject to review by the Architect.
- B. Isolation Coatings: Paint product specified herein shall be such as manufactured by The Sherwin Williams® Company, Cleveland, OH, (800)321-8194 or (800)474-3794; www.sherwin-williams.com, or comparable manufacturer's equivalent products subject to review by the Architect. Provide the following:
 - 1. Aluminum Contact With Steel: Wherever aluminum items are to be secured to, or in contact with steel supporting members, paint the contact surface of the steel with the following self-priming paint product for both the surfaces of the steel supporting members and the aluminum.
 - a. Two (2) Coats: Macropoxy® 646 Fast Cure Epoxy, B58.
 - 2. Aluminum Contact With Masonry or Concrete: Wherever aluminum items are to be secured to or in contact with masonry or concrete, paint the aluminum contact surface with the following self-priming paint product.
 - a. Two (2) Coats: Macropoxy® 646 Fast Cure Epoxy, B58.
 - 3. Finish Surfaces: Allow all paint coats to dry thoroughly prior to installation of aluminum Work. Exposed to view surfaces shall be clean and free of isolation coatings.
- C. Workmanship: All shop and field Work shall be done by skilled tradesman thoroughly experienced in this type of Work. Workmanship shall be of recognized high quality; and shall be first class in every respect, in accordance with the best, modern practice.
- D. Installation:
 - 1. Install pass-thru window(s) plumb, level, square, true to line, and without warp or rack.
- E. Anchorage: Anchor pass-thru window(s) securely in place to supports. Use attachment methods permitting adjustment for construction tolerances, irregularities, alignment, and expansion and contraction.
- F. Joint Sealants: Install joint sealants as specified in Section 07 90 00.
- G. Repair Work: Repair minor damages to finish in accordance with manufacturer's instructions and as approved by the Architect.
- H. Damaged Components: Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.05 CLEANING

- A. Clean pass-thru window(s) promptly after installation in accordance with manufacturer's instructions.
- B. Remove excess joint sealant in accordance with sealant manufacturer's instructions.
- C. Do not use harsh cleaning materials or methods that would damage glazing or finish.

3.06 PROTECTION

- A. Installed Pass-Thru Window(s): Protect installed pass-thru window(s) to ensure that pass-thru window(s) will be without damage or deterioration at time of substantial completion.

3.07 CLEAN-UP

- A. When building is completed, thoroughly clean and polish all aluminum in accordance with the directions of the manufacturer, and leave in a satisfactory condition.
- B. Clean-up all Work soiled in the performance of Work under this section.
- C. During progress of the Work keep the premises free of all debris and waste materials resulting from the Work of this section. During progress of the Work, upon completion of Work, and before final acceptance of the Work, remove all scrap, construction debris and rubbish from the site, and dispose of legally. Upon completion and before final acceptance of the Work, remove all unused materials, tools, and equipment from the site.

3.08 INSTRUCTIONS FOR OPERATION

- A. Pass-Thru Window Instructions: Provide instruction to Owner maintenance personnel in proper pass-thru window operating procedures and maintenance schedule.

END OF SECTION

SECTION 08 70 00FINISH HARDWARE

The requirements of the "General Conditions", the "Supplementary Conditions", and "Division 1" sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Furnish and/or provide all labor, materials, equipment, apparatus, tools, transportation, protection and services necessary for, and reasonably incidental to the proper execution and completion of all Finish Hardware Work, as indicated on the Drawings and specified herein.
- B. Door and Frame Schedule: Refer to the Drawings.
- C. Related Sections: The following items of related Work will be provided for under other sections of the Specifications as indicated:
 - 1. Roof and Wall Specialties and Accessories - Section 07 70 00.
 - 2. Hollow Metal Doors and Pressed Steel Door Frames - Section 08 11 13.
 - 3. Overhead Coiling Doors - Section 08 33 23.
 - 4. Gypsum Wallboard Construction - Section 09 29 00.
 - 5. Exterior Painting and Finishing - Section 09 91 13.
 - 6. Interior Painting and Finishing - Section 09 91 23.
 - 7. Electrical Work - Division 26.
 - 8. Hardware for Chain Link Fences and Gates - Section 32 31 13.

1.02 REFERENCE SPECIFICATIONS, CODES, AND APPLICABLE STANDARDS

- A. Requirements of Regulatory Agencies: Furnish all finish hardware in strict compliance with laws, codes, ordinances and regulations of the public authorities having jurisdiction, including Title III of The Americans With Disabilities Act (ADA), Public Law 101-336. After award of the finish hardware subcontract, no additional payment will be made for additional hardware or changes in the specified hardware, required to comply with the above requirements. All door closers shall meet ADA requirements for opening force.
- B. Door Hardware: Provide door hardware in compliance with the 2014 Indiana Building Code, (2012 International Building Code with State of Indiana Amendments) which includes, but is not necessarily limited to the following:

1. Door handles, pulls, latches, locks and other operating devices shall be at a maximum height of 48 inches (1219 mm) above the finished floor. The operating devices shall be capable of operation with one hand and shall not require tight grasping, tight pinching or twisting of the wrist to operate. All means of egress doors shall be of a side-swinging type. All doors shall swing in the direction of egress where serving an occupant load of 50 or more persons or where serving a high-hazard occupancy. The opening force for interior side-swinging doors without closers shall not exceed a 5-pound (22 N) force. For all other side-swinging, sliding and folding doors, the door latch shall release when subjected to a 15-pound (66 N) force. The door shall be set in motion when subjected to a 30-pound (132 N) force. The door shall swing to a full-open position when subjected to a 15-pound (66 N) force. Forces shall be applied to the latch side.
- C. Standards: All exterior finish hardware materials shall meet local building code requirements for uplift resistance, and wind loads.
- D. All hardware to conform to the following.
 - a. American National Standards Institute (ANSI).
 - b. American Society of Hardware Consultants (ASHC).
 - c. Builders Hardware Manufacturers Association (BHMA).
 - d. Federal Specifications (FS).
 - e. National Builders Hardware Association (NBHA).
- E. Substitutions: Except for the requirements specified herein, furnish all hardware in accordance with the Drawings, Specifications, and Schedules, without substitutions. Before ordering hardware, check all Drawings and codes to insure the proposed hardware will provide the performance and function required and will fit the Work to which it is attached. Furnish all hardware to complete the Work and conform with all requirements and conditions, at no extra cost to the Owner.

1.03 QUALITY ASSURANCE

- A. Supplier: Recognized architectural finish hardware supplier, with warehousing facilities, who has been providing hardware for period of not less than three (3) years. The supplier shall be, or employ, a certified Architectural Hardware Consultant (AHC), who is registered in the continuing education program as administered by the Door and Hardware Institute(DHI). The hardware schedule shall be prepared and signed by a certified AHC.
- B. Installer: Firm with not less than three (3) years experience in installation of similar hardware to that required for this Project, including specific requirements indicated.
- C. Fire-Rated Openings: Door hardware for fire-rated openings shall comply with the current edition of National Fire Protection Association, NFPA 80 - Standard for Fire Doors and Other Opening Protectives, and the requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by UL, Warnock Hersey, FM, or other testing and inspecting organization acceptable to authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.

1.04 SUBMITTALS

- A. General: Submit Shop Drawings and Product Data to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

- B. Master Key Schedule: In conjunction with the Owner, prepare a detailed schematic Master Key Schedule for the entire installation. Submit Schedule to Owner in triplicate for review and approval. Revise Schedule until acceptable to the Owner.
- C. Contractor Finish Hardware Schedule: Prior to ordering materials, prepare a detailed Finish Hardware Schedule listing all items of finish hardware proposed for use. Prepare the Schedule, following the same form as Finish Hardware Schedule specified herein. Check all details for the proper type strike plates, lengths of spindles, hand, backset, and bevel of locks. The schedule shall be reviewed prior to submission by a certified Architectural Hardware Consultant, who shall affix his or her seal attesting to the completeness and correctness of the schedule. Submit four (4) copies of the Schedule to the Architect for review and approval. The Architect will review the Schedule same as specified for Shop Drawings. After final acceptance of the Schedule, submit four (4) correct copies to the Architect.
- D. Wiring Diagrams: Provide complete and detailed system operation and elevation diagrams specially developed for each opening requiring electrified hardware, except openings where only magnetic hold-opens or door position switches are specified. Provide these diagrams with hardware schedule submittal for approval. Provide detailed wiring diagrams with hardware delivery to jobsite.

1.05 PRE-INSTALLATION MEETING

- A. Job-Site Meeting: Before starting Work, arrange a job-site meeting with representatives of the General Contractor, Owner, representatives of other entities directly concerned with installation of door hardware, and the Architect to discuss procedures, Specifications, finishes, installations, job readiness, material storage and protection, and any questions pertaining to the Finish Hardware Work.
- B. Date of Meeting: Convene minimum one (1) week prior to commencing Work of this section.
- C. Participants: Include persons involved with installation of doors, frames, and hardware.

1.06 PRODUCT DELIVERY

- A. Delivery: All finish hardware shall be shipped F.O.B. to Project site or other location directed by hardware installer. Obtain signed receipts for deliveries from receiving parties.
- B. Shipping Instructions: Unless otherwise directed, ship all hardware in original containers, with seals unbroken. Clearly mark each container or item to agree with the Hardware Schedule and to show complete identification and designated location for each building.
- C. Finish Hardware: The Finish Hardware Contractor will provide all finish hardware not included in other trades, and provide for storage and installation. Finish Hardware Contractor shall be responsible for safekeeping, furnishing templates to proper Contractors, proper installation, receiving shipments and delivery of keys for hardware.

1.07 WARRANTY

- A. Form of Warranty: Execute a written warranty in the approved form, warranting all material and Work furnished under this section to be free from defects and faulty workmanship and materials under normal use and service, and promptly replace defective material or workmanship without cost to the Owner. The warranty period for all Work shall be not less than one (1) year from the date of Owner's acceptance.
- B. Limited Warranties: In addition to the above warranty, obtain and provide, as required, from the finish hardware manufacturer written warranties for the following products, at no charge to the Owner.

1. Warranty shall not cover defects or damage arising from improper installation, lack of or improper maintenance, improper storage, shipping and handling, corrosion, erosion, ordinary wear and tear, misuse, abuse, accident, unauthorized service, or use with unauthorized non-specified manufacturer's products or parts.
2. Liability of the manufacturer shall be limited to the repair or replacement of any product or component part which shall prove defective as covered by the warranty, within the stated minimum time period listed below, after delivery to the original purchaser.

<u>Product</u>	<u>Time Periods</u>
Mortise Lock	7 Years
Closer	10 Years
Exit Device or Trim	5 Years
Overhead Holders & Stops	5 Years
Electromechanical and Electric Products	2 Years

- C. At completion of Project, a qualified factory representative shall inspect closer installations. After this inspection, a letter shall be sent to Architect reporting on conditions, verifying that closers have been properly installed and adjusted.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. General: The Finish Hardware Schedule and materials specified on the Drawings contain manufacturer's catalog numbers as a means of describing type, materials, strength, design, quality, weight, construction, function and operation of the hardware items required. Unless otherwise noted on the Drawings, furnish all materials of the same kind, i.e., locksets, closers, hinges of the same manufacturer, and use as few manufacturers as possible.
- B. Cylinders: Provide cylinders by one of the following, subject to review by the Owner and/or Architect.
1. Best® Access Systems.
 2. Corbin Russwin®.
 3. ALLEGION™ (formerly Ingersoll-Rand Security Technologies).
 4. Schlage Commercial Division.
 5. Sargent Manufacturing Company.

2.02 MATERIALS

- A. Keys and Keying: Key and master key all locks in accordance with the accepted Master-Key Schedule. Furnish not less than two (2) change keys for each lock and three (3) master keys. Deliver master keys directly to the Owner.
1. Key Control System: Provide a key control system including envelopes, labels, tags with self-locking key clips, receipt forms, temporary markers, and permanent markers.

- B. Templates: Fabricate hardware coming in contact with metal frames or doors to template and furnish with proper screws. Furnish all necessary paper or physical templates and schedules required to prepare doors and frames for, and to apply, the hardware. Furnish templates and schedules at such time as not to delay the Work. Expansion shields shall be provided for securing items of hardware to concrete, metal or masonry.
- C. Maintenance Tools and Instructions: Provide a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware. Furnish in a labeled separate package, two (2) each of all special tools required to adjust each item of hardware, including items such as door closer keys, lock and latch set adjustment wrenches, exit device dogging keys, emergency operation keys, spanner wrenches, and allen wrenches.
- D. Fasteners: Provide all hardware with screws, bolts, and fasteners, as required to install and secure hardware in place. Where exposed in the Finish Work, heads of screws, bolts, and other exposed fastener surfaces shall be of finish to match the adjacent hardware surface.

2.03 HARDWARE FINISHES

- A. Hardware shall match surrounding permanent finishes, unless specifically indicated otherwise.
- B. Hardware Schedule shall indicate finishes.
- C. Surface mounted door closer finish shall match adjacent hardware, unless otherwise specified.
- D. Finish Codes identifying the finish and base material are American National Standard Institute (ANSI) standards (ANSI/BHMA A156.18) as sponsored by the Builders Hardware Manufacturers Association (BHMA). For convenience and coordination, U.S. equivalent code designations are also specified.

BHMA FINISH CODE	NEAREST U.S. EQUIVALENT	FINISH DESCRIPTION	BASE MATERIAL
-	AP	Aluminum powder coated	steel
-	SB	Silver Bronze (Sprayed Aluminum)	-
600	USP	Primed for painting	steel
601	US1B	Bright black japanned	steel
602	US2C	Zinc plated, commercial	steel
603	US2G	Zinc plated	steel
605	US3	Bright brass, clear coated	brass
606	US4	Satin brass, clear coated	brass
609	US5	Satin brass, blackened, satin relieved, clear coated	brass
610	US7	Satin brass, blackened, bright relieved, clear coated	brass
611	US9	Bright bronze, clear coated	bronze
612	US10	Satin bronze, clear coated	bronze
613	US10B	Antique bronze, oiled	brass/bronze
616	US11	Satin bronze, blackened, satin relieved, clear coated	bronze
618	US14	Bright nickel plated, clear coated	brass/bronze
619	US15	Satin nickel plated, clear coated	brass/bronze
620	US15A	Satin nickel plated, blackened, satin relieved, clear coated	brass/bronze
621	US17A	Nickel plated, blackened, relieved, clear coated	brass/bronze
625	US26	Bright chromium plated	brass/bronze
626	US26D	Satin chromium plated	brass/bronze
629	US32	Bright stainless steel	stainless steel 300 Series
630	US32D	Satin stainless steel	stainless steel 300 Series
632	US3	Bright brass plated, clear coated	steel
633	US4	Satin brass plated, clear coated	steel
636	US7	Satin brass plated, blackened, bright relieved, clear coated	steel
637	US9	Bright bronze plated, clear coated	steel
638	US5	Satin brass plated, blackened, satin relieved, clear coated	steel
639	US10	Satin bronze plated, clear coated	steel
640	US10B	Antique bronze, oiled	steel
643	US11	Satin bronze plated, blackened, satin relieved, clear coated	steel
645	US14	Bright nickel plated, clear coated	steel
646	US15	Satin nickel plated, clear coated	steel
647	US15A	Satin nickel plated, blackened, satin relieved, clear coated	steel
648	US17A	Nickel plated, blackened, relieved, clear coated	steel
651	US26	Bright chromium plated	steel
652	US26D	Satin chromium plated	steel

2.04 DOOR SCHEDULE AND ADDITIONAL HARDWARE REQUIREMENTS

- A. General: Provide hardware for each door to comply with the requirements of the “Door and Frame Schedule” and “Door Hardware” as indicated and specified on the Drawings.
- B. Hardware Sets: Manufacturer and product designated, size, and finish and/or color, as applicable.
 1. All hardware locksets and hinges shall have a US26D finish unless noted otherwise.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Finish Hardware:

1. Prepare all doors to receive the hardware. Install and adjust all hardware properly, in accordance with the manufacturer's instructions. Attach and secure the hardware so that no parts are damaged or injured. Install all required weatherstripping and door sweeps, and overhead rain drip at exterior doors.
2. Hardware shall be completely fitted before the final coat of paint or other finish is applied, and then removed for the final coat. Mortise and cutting shall be done neatly and all evidence of cutting shall be concealed in the finished Work. Hardware shall be permanently installed after finishing operations are complete and dry. Protect levers from scratching or other damage, adjust hardware, and turn over to the Owner, in perfect operating condition.
3. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations and except as may be otherwise directed by Owner Representative.

3.02 CLEAN-UP

- A. Work Required: Clean-up any Work soiled in the performance of the Work under this section.
- B. Debris and Waste Materials: During progress of the Work, upon completion of Work, and before final acceptance of the Work, keep the premises free of debris and waste materials resulting from Work of this section. Remove all construction debris and rubbish to central area designated by General Contractor, for general clean-up by General Contractor, or if directed by General Contractor to remove from the site and legally dispose.
- C. Unused Materials, Tools, and Equipment: Upon completion of Work and before final acceptance of the Work, remove all unused materials, tools, and equipment from the site.

3.03 FINAL ADJUSTMENT

- A. Provide the services of a competent Hardware Specialist to inspect the installation of all hardware furnished, and report any installation adjustments necessary to place all hardware in perfect working order, before final payment.
- B. Replace units which cannot be adjusted for proper operation.
- C. Final adjustment must occur within one (1) week of occupancy by the Owner. Make all final adjustments to the complete satisfaction of the Owner.
- D. Upon completion of the installation, the Contractor shall as a condition of its acceptance, deliver to the Architect, a report stating that the Contractor's inspection was made, that all recommended adjustments have been completed, and that all finish hardware provided under this section has been installed and is in optimum working condition.

END OF SECTION

SECTION 08 80 00GLAZING

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, equipment, apparatus, tools, transportation, protection, and services necessary for Glazing Work indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Glass for Hollow Metal Doors and Windows.
 - 2. Glass for Aluminum Frames.
- B. Related Sections: The following items of related Work will be provided under other sections of the Specifications as indicated:
 - 1. Glass Washing by the General Contractor - Section 01 70 00.
 - 2. Hollow Metal Doors and Frames - Section 08 11 13.
 - 3. Entrances and Storefronts - Section 08 41 00.

1.02 APPLICABLE STANDARDS AND SPECIFICATIONS

- A. General: Except as otherwise specified herein, materials and Work shall conform to the current editions of the following standards and specifications. Contractor shall obtain copies of the following standards and specifications for reference and keep at the Project field office.
 - 1. Glass Association of North America (GANA) “Glazing Manual” and “GANA Sealant Manual”.
 - 2. ASTM International Standard Specifications referred to herein by number.
 - 3. Federal Specifications referred to herein by number.
 - 4. Safety Standard for Architectural Glazing Materials, Federal Specification CPSC 16 CFR 1201.

1.03 QUALITY ASSURANCE

- A. General: All materials, articles, and accessories incorporated in the Work shall be of type and quality specified herein and shall be subject to the Architect’s review. Methods of preparation, construction and installation shall be in accordance with approved Shop Drawings, manufacturer’s printed specifications, the Architect’s Drawings and Specifications, and as directed by the Architect.
- B. Installer’s Qualifications: Glazing Work shall be installed by a firm with not less than five (5) years successful experience in the installation of the indicated and specified systems.

C. Glass Labeling:

1. Manufacturer's Labels: All glass shall bear the manufacturer's label to identify the kind and grade. Unless otherwise specified, labels shall not be removed until immediately after the glass is accepted.
2. Permanent Labels: Tempered glass and fire-rated glass units shall be provided with a permanent label indicating type of glass. Label shall be etched, or ceramic fired on glass, and shall be visible on installed unit at an inconspicuous corner area.
 - a. Insulating Glass products are to be permanently marked either on spacers or at least one insulating unit component with appropriate certification label of inspecting and testing agency indicated below:
 - 1) Insulating Glass Certification Council (IGCC).

- D. Single-Source Fabrication Responsibility: All glass fabricated for each type shall be processed and supplied by a single fabricator.

1.04 SUBMITTALS

- A. General: Submit Shop Drawings, Product Data, Compatibility Reports, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Compatibility Reports: Glazing Contractor shall obtain compatibility reports from component manufacturers (such as opacifier, ceramic frit paint, sealants, gaskets, setting blocks, etc), ensuring that the glazing materials were tested for compatibility.
- C. Product Data: Provide manufacturer's literature completely describing each product.
- D. Product Certification: Provide product certificates signed by glazing materials manufacturers certifying that their products comply with specified requirements.
- E. Color Samples: Submit two (2) Samples of each of the following:
1. 12" x 12" Samples of spandrel glass

1.05 MATERIAL DELIVERY AND STORAGE

- A. Delivery: All materials shall be delivered to the site in protective crates and wrappings clearly labeled with pertinent information to facilitate checking. Unload in areas designated by the General Contractor. All glass shall be shipped to the job packed in original containers with seals unbroken.
- B. Storage: Materials shall be stored at the site, off the ground and in protected dry storage facilities, until ready for installation.

1.06 PROJECT CONDITIONS

- A. Environmental Conditions: Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by the glazing materials manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.07 WARRANTY

- A. Form of Warranty: Provide a warranty, in the approved written form, warranting all Work against defective materials and workmanship for a period of not less than one (1) year from the date of Owner's acceptance of installation.
- B. Neoprene Glazing Strips: Provide not less than a two (2) year written warranty, from date of Owner's acceptance, warranting neoprene glazing strips against sagging, unsatisfactory length, and improper installation.
- C. Insulating Glass: The glass manufacturer shall provide not less than a one (1) year warranty period stating that the product shall be free from material defects. Warranty period shall commence from the date of Owner's acceptance of installation.
- D. Spandrel Glass:
 - 1. Opacifier: Warrant opacifier (silicone coating) for a period of not less than ten (10) years from date of installation against lost adhesion to the glass surface, flaking, peeling, chipping or developing any noticeable color change.

PART 2 - PRODUCTS

2.01 GLASS MANUFACTURERS

- A. Manufacturer: Glass products specified herein shall be manufactured by Vitro Architectural Glass (formerly PPG Glass), Vitro Glass Technology Center, 400 Guys Run Road, Cheswick, PA 15024, (800)377-5267; www.vitroglazing.com.
- B. Comparable Manufacturers and Products: Aluminum framing by the following manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.
 - 1. AGC Glass Company North America, Inc., 11175 Cicero Drive, Suite 400, Alpharetta, GA 30022-1167, (800)251-0441; www.us.agc.com.
 - 2. Guardian Industries, Corp., 2300 Harmon Road, Auburn Hills, MI 48326, (248)340-1800; www.guardian.com.
 - 3. Pilkington North America, Inc., 811 Madison Ave., Toledo, OH 43604-5684, (419)247-3731 or (800)221-0440; www.pilkington.com.
 - 4. Viracon, Inc, 800 Park Drive, Owatonna, MN 55060, (800)533-2080 or (507)451-9555; www.viracon.com.

2.02 GLASS MATERIALS

- A. Grading of Glass: All glass shall be new materials conforming to the applicable requirements of the following:
 - 1. Consumer Product Safety Commission (CPSC), Safety Standard for Architectural Glazing Materials (Federal Spec. 16CFR1201).
 - 2. ASTM C1036 - Standard Specification for Flat Glass.

3. Tempered glass shall meet the requirements of ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; Kind HS, Kind FT Coated and Uncoated Glass, and ANSI Z97.1-2009.
4. Insulating glass units shall be certified through the Insulating Glass Certification Council (IGCC) in compliance with ASTM Standard E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.

B. Glass Types and Locations:

1. Float Glass: Clear float glass, glazing quality, of 1/4" thickness as noted on Drawings, Type I, Class I, Quality-Q3. Provide glass for the following locations:
 - a. Interior Hollow Metal Window Framing.
2. Tempered Float Glass: Clear float glass, of 1/4" thickness as noted on the Drawings. Glass shall be fully tempered glazing quality, Vitro Architectural Glass. "Herculite®" or approved equal. Provide glass for the following locations:
 - a. Hollow Metal Doors.
 - b. Aluminum Window Framing.
 - c. Where Required by Drawings.
3. Insulating Glass: Vitro Architectural Glass, 1" thick, dual glazed construction, Solarban®R100(2) Solargray on 1/4" thick tinted heat-strengthened float glass outboard lite and 1/4" thick clear float glass inboard lite separated by metal spacer around perimeter, and hermetically sealed with organic sealants. Air cavity shall be 1/2" wide filled with a mixture of 10% air and 90% Argon.
 - a. Glass Performance Characteristics (Minimum Values Required):
 - 1) Visible Light Transmittance (VLT): 21%.
 - 2) Exterior Visible Light Reflectance: 12%.
 - 3) Winter U-factor (U-value): 0.29.
 - 4) Solar Heat Gain Coefficient (SHGC): 0.17.
 - b. Provide Glass for the following locations:
 - 1) Exterior Aluminum Window Framing.
 - 2) Tempered Float Glass: Provide where required by Drawings.
4. Insulating Glass: Vitro Architectural Glass, 1" thick, dual glazed construction, Solarban®60 on 1/4" thick clear heat-strengthened float glass outboard lite and 1/4" thick clear float glass inboard lite separated by metal spacer around perimeter, and hermetically sealed with organic sealants. Air cavity shall be 1/2" wide filled with a mixture of 10% air and 90% Argon.
 - a. Glass Performance Characteristics (Minimum Values Required):
 - 1) Visible Light Transmittance (VLT): 70%.
 - 2) Exterior Reflectance: 11%.

- 3) Winter U-factor (U-value): 0.24.
- 4) Solar Heat Gain Coefficient (SHGC): 0.39.

b. Provide Glass for the following locations:

- 1) Hollow Metal Window Framing.
- 2) Tempered Float Glass: Provide where required by Drawings.

5. Spandrel Glass: Insulating glass, 1" thick, dual glazed construction, 1/4" thick "Solargray" tinted heat-strengthened float glass outboard lite and 1/4" clear tempered glass inboard lite with OPACI-COAT-300® opacifier as specified herein applied on the #3 surface, separated by metal spacer around perimeter, and hermetically sealed with organic sealants. Air seal 1/2" wide shall be kept at atmospheric pressure and dehydrated by an integral drying agent.

a. Glass Performance Characteristics (Center of Glass):

- 1) Winter U-factor (U-value): 0.29.

b. Provide Glass for the following locations:

- 1) Exterior Aluminum Window Framing as indicated on the Drawings.

C. Glass Edges:

1. General: Fabricate glass and other glazing products in sizes required to glaze openings. Edge and face clearances, edge and surface conditions, and bite shall comply with product manufacturer recommendations, and referenced glazing standards as required to comply with system performance requirements.

2.03 MISCELLANEOUS

A. Structural Glazing Sealants:

1. General: Spectrem® 2 - High Performance Silicone Sealant by Tremco® Incorporated, Commercial Sealants & Waterproofing Division, 3735 Green Road, Beachwood, OH 44122, (216)292-5000 or (800)321-7906; www.tremcosealants.com. Color shall match Aluminum Work.

B. Caulking Compound: Product shall comply with "American National Standards Institute Specifications for Silicone Rubber Sealant Building Sealing Compounds for the Building Trade", ANSI A-116.1, Federal Specification TT-S-001543, non-sag Class A.

C. Glazing Strips: At aluminum framing, unless otherwise recommended by glass manufacturer, provide neoprene glazing strips cut 6" longer each end than the aluminum moulding (to be compressed back toward the middle in making installation).

D. Gasket Seal: Provide positive method for sealing gasket to glass, such as fine bead of clear silicone on top edge of gasket, or similar industry accepted method.

E. Opacifier:

1. Manufacturer: Industrial Control Development, Inc., 13911 NW Third Court, Suite 100, Vancouver, WA 98685-5701, (360)546-2286; www.icdcoatings.com.
 2. Product: ICD, OPACI-COAT-300® water-based silicone glass coating, ozone and ultra violet radiation resistant high performance silicone coating without any lead or organic solvents. Coating thickness shall be a minimum of 8 mils (0.008/0.2 mm) applied.
 3. Colors: To match insulating glass.
 4. Approved Factory Fabrications: Only Approved Factory Fabricators (AFF) are allowed to produce the OPACI-COAT-300® silicone spandrel, as AFF glass fabricators are certified and trained by ICD in the application and manufacture of the spandrel glass.
- F. Shift Arrestors: As recommended by Glass and/or Aluminum Work manufacturer.
- G. Setting Blocks: Unless otherwise recommended by glass manufacturer, provide neoprene setting blocks of 70-90 durometer, not less than 4" long x 1/4" thick.

PART 3 - EXECUTION

3.01 FIELD MEASUREMENTS

- A. Contractor shall obtain field measurements of adjoining Work as required to locate and fit the Work of this section. Contractor shall be responsible for the accurate fitting of the materials together and to the building(s).

3.02 GLASS INSTALLATION

A. Measurements:

1. Contractor shall obtain field measurements of all glass openings, and size glass to suit the pass-thru window as recommended by the pass-thru window manufacturer.
2. Glass shall be not more than 3/16" less in either dimension than the clear measurements between back of rabbets, except as otherwise specified herein.

B. Setting Glass:

1. General: Set all glass in accordance with the referenced standard, GANA "Glazing Manual", for the frame types specified, except as specified herein.
2. Methods: Where glass is to be set dry without glazing compounds or tape, set glass on setting blocks at the quarter points on the bottom frame, secure in place, and cover with the exterior trim piece. Installation of aluminum shall be in accordance with the manufacturer's directions.
3. Aluminum Frames: Set glass with setting blocks at the quarter points on the bottom frame to support each light of glass. Install glass shift arrestors in aluminum frame to prevent shifting of glass. Locate in corner adjacent to deep glazing pocket as per aluminum framing manufacturer's recommendations. Compress neoprene glazing gaskets back toward middle when installing.
4. Sealing: Remove contaminants from sealant bonding surfaces, mask adjacent areas, and apply sealant with hand gun or pressure equipment. Tool joint immediately after application, remove masking tape, and clean-off excess sealant with xylene or other commercial solvent.

3.03 GLASS REPLACEMENT

- A. At completion of the Work, replace all glass provided under this section which has been damaged, or broken due to improper setting, at no cost to the Owner.
- B. Glass shall be judged to be damaged by improper setting when cracked or broken due to loose setting, binding in the frame, unevenly bedded or pinched by glazing stops.

3.04 CLEAN-UP

- A. When the building is completed, thoroughly clean and polish all glass in accordance with the directions of the manufacturer and leave in a satisfactory condition.
- B. Washing glass shall be by the General Contractor as specified in Section 01 70 00 - Project Closeout.
- C. Clean-up all Work soiled in the performance of Work under this section.
- D. During progress of the Work keep the premises free of all debris and waste materials resulting from the Work of this section. During progress of the Work, upon completion of Work, and before final acceptance of the Work, remove all debris and rubbish from the site, and dispose of legally. Upon completion and before final acceptance of the Work, remove all unused materials, tools, and equipment from the site.

END OF SECTION

SECTION 09 22 16NON-STRUCTURAL METAL STUD FRAMING

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, equipment, and services necessary for Gypsum Wallboard Work indicated on the Drawings and specified herein. Work includes, but is not limited to the following:
1. Non-Load Bearing Metal Stud Framing for Interior Work.
 2. Load-Bearing Metal Stud Framing for Interior Work.
 3. Suspension System for Gypsum Wallboard Ceilings.
- B. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:
1. Rough Carpentry Work - Section 06 10 00.
 2. Pressed Steel Door Frames - Section 08 11 13.
 3. Gypsum Wallboard - Section 09 29 00.

1.02 REFERENCE SPECIFICATIONS

- A. ASTM International Standard Specifications: As referred to herein, and throughout this section.
1. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.
 2. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.03 QUALITY ASSURANCE

- A. Contractor shall provide effective, full time quality control over all fabrication and erection complying with the pertinent codes and regulations of government agencies having jurisdiction. Conduct pre-installation meeting to verify project requirements, substrate conditions, and manufacturer's installation instructions.
- B. Manufacturer shall be a current member of the SFIA and be listed on the official website or be a part of a similar organization that provides a verifiable code compliance program.
- C. Fire-Resistance Ratings: Where indicated, provide materials and construction which are identical to those of assemblies whose fire resistance rating has been determined in accordance with ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials, by a testing and inspecting organization acceptable to authorities having jurisdiction.

1. Design: Provide fire-resistance-rated assemblies identical to those indicated by reference to the current editions of GA File No's in GA-600 "Fire Resistance Design Manual" by the Gypsum Association (GA) or to design designations in Underwriters' Laboratories, Inc. (UL) "Fire Resistance Directory" as indicated on the Drawings.

1.04 SUBMITTALS

- A. General: Submit Shop Drawings and Product Data to Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Shop Drawings:
 1. Load Bearing Framing: Include placing drawings for framing members showing size and gauge designations, number, type, location, and spacing. Indicate supplemental strapping, bracing, splices, accessories, and details required for proper installation. Detail connections to structural steel and structural concrete. Indicate member gauges, spacing, and sizes.
 2. Structural Calculations: Submit complete structural calculations for load bearing metal stud framing indicating loads, stresses, and deflections for members and connections. Calculations shall be sealed by a professional Engineer licensed in the State of the proposed Project, experienced in the design of light gauge framing.
- C. Product Data: Submit Product Data for each type of product specified.

1.05 SYSTEM REQUIREMENTS

- A. Performance Requirements: Fabricate and install systems as indicated but not less than that required to comply with ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products and American Iron and Steel Institute Publication "S220 - North American Specification for the Design of Cold-Formed Steel Framing – Nonstructural Members".
 1. Gypsum Board Partitions:
 - a. Standard Systems: maximum deflection of L/240 of partition height.
 - b. Systems to Receive Water-Resistant Gypsum Board or Cement Backer Board: Maximum deflection of L/360 of partition height.
 - c. Interior Suspended Ceilings: Maximum deflection of L/360 of distance between supports.
 - d. Design Loads: Minimum of 5 p.s.f. unless otherwise indicated on the Drawings.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. General:
 1. Deliver all materials to the site in protective wrappings, clearly labeled with pertinent information to facilitate checking. Unload in areas designated by the General Contractor.
 2. When material delivery schedules necessitate delivery of the materials before the building is enclosed, or prior to installation of the materials, provide weathertight protection in the form of frame construction, with solid wall sheathing and a pitched roof, for the temporary storage of the materials. A waterproof covering of wallboard in lieu of the temporary building is not acceptable.

1.07 SCAFFOLDING

- A. Furnish, erect, and maintain all scaffolding and ladders in accordance with local, state, and national safety codes. Equipment shall be erected at times and locations so as not to delay any part of Work. When no longer required, promptly dismantle equipment and remove from site.

1.08 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

PART 2 - PRODUCTS

2.01 METAL FRAMING MATERIALS AND ACCESSORIES

- A. Metal Stud Framing Systems:
 - 1. Non Load-Bearing: Framing system consisting of metal studs of sizes required for wall-thicknesses, or of sizes noted on the drawings, and/or required by field conditions, with mating floor and ceiling track, and all erection accessories. Studs and tracks shall be of cold rolled steel channels conforming to ASTM Standard C645, of not less than the following thicknesses, unless otherwise noted on the Drawings.
 - a. 25 gauge thick for partitions up to 16'-0" high 16" O.C.
 - b. 20 gauge thick for partitions over 16'-0" high (but less than 18'-0" high), at 16" O.C.
 - c. Where partitions of greater height are required by the Drawings, a heavier gauge shall be required and shall be subject to the Architect's review.
 - 2. Load-Bearing: Galvanized steel framing system conforming to ASTM C955 – Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum panel Products and metal Plaster Bases; shall be 20 gauge (min.) "SJ" style stud members ("C" type studs with stiffening ribs) of sizes and lengths noted on Drawings, with mating running track, and all required erection accessories such as lintels, strappings, clip angles, joists, as manufactured by United States Gypsum Company.
 - 3. Protective Coating: Comply with ASTM C 645; ASTM A 653/A 653M G40 (Z120), Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40 (Z120) or DiamondPlus® coating; roll-formed from steel meeting mechanical and chemical requirements of ASTM A 1003 with a zinc-based coating. Galvanized products are not acceptable.
 - a. Coatings shall demonstrate equivalent corrosion resistance with an evaluation report acceptable to the authorities having jurisdiction.
- B. Non-Fire Rated Wall Deflection Track: Self-locking metal studs with telescoping stud extension with knockout in each flange to allow for minimum 1 inch (25 mm) of deflection unless otherwise noted on the Drawings.

C. Fire Rated Wall Deflection Track:

1. Manufacturer: Fire Trak Corp., P.O. Box 485, 104 Cedar Ave. S., Watkins, MN 55389, (800)394-9875, www.firetrak.com.
2. Product: Shadowline.
3. Deflection: 1 inch unless otherwise noted on the Drawings.
4. U.L. Listing: HW-D-0060 assembly rating as noted on the Drawings.

D. Control Joint Backer: Metal profile which supports intumescent materials located inside and spanning gap between opposing drywall edge at control joint locations.E. Steel Channels: Provide where required; 1-1/2" cold rolled steel channels weighing not less than 475 pounds per 1000 linear feet; 2-1/2" cold rolled steel channels weighing not less than 800 pounds per 1000 linear feet. All channels shall be galvanized.F. Furring Channel: Provide furring widths (depths) as noted on the Drawings and/or where required by field conditions.

1. Hat-Shaped Metal Channels: Cold rolled, electro-galvanized sheet steel, United States Gypsum Company, www.usg.com; #DWC-25, not less than 25 gauge, conforming to ASTM Standard C645.
2. Z-Furring Metal Channels: Interior Framing Product, Z-Furring as manufactured by ClarkDietrick™ Building Systems, 9100 Centre Pointe Drive, Suite 210, West Chester, OH 45069, (800)543-7140 or (513)870-1100; www.clarkdietrich.com. Furring channels shall be not less than 25 gauge corrosion resistant galvanized steel, conforming to ASTM Standards A653 and A754.

G. Felt Protection Strips: Where required by Drawings and/or field conditions; provide Type I, No. 15, unperforated felt conforming to ASTM D226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing, in width as required to fully cover contact surface area between metal studs and/or furring channels and exterior wall.H. Wire Hangers: Not less than 8 gauge ASTM A614/A614M, Class 1 zinc coated, soft tempered, steel wire or 1" x 3/16" unperforated galvanized steel bands.I. Tie Wire: ASTM A614/A614M, Class 1 zinc coated, soft tempered, steel wire, 16 gauge minimum.J. Angle-Type Hangers: Unless otherwise indicated on the Drawings; provide angles with legs not less than 7/8 inch wide, formed from 0.0635 inch thick galvanized steel sheet complying with ASTM Standard A653 (formerly ASTM Standard A446), Coating Designation G90, with bolted connections and 5/16 inch diameter bolts.K. Grid Suspension System for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong World Industries, Inc.
 - b. Chicago Metallic Corporation.

- c. United States Gypsum Company.

PART 3 - EXECUTION

3.01 INSTALLATION GENERAL

- A. Installation Standard: ASTM C754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.02 METAL STUD FRAMING (NON LOAD-BEARING TYPE STUDS)

- A. Furnish and install non-load bearing metal stud framing for gypsum wallboard partitions, support of gypsum wallboard in locations noted, or where other types of framing are not provided. Framing shall consist of vertical studs framed into continuous top and bottom tracks. Studs shall be of sizes noted on the Drawings or as required to produce the partitions of thicknesses noted, and tracks shall be of mating sizes. In general, framing shall be of single stud depth. Where wall thickness is greater than stud depths, and where plumbing spaces are indicated, frame each wall surface with a separate stud frame.
 - 1. Where partitions are to have gypsum wallboard on both sides, use 25 gauge metal studs for partitions up to 16'-0" high; use 20 gauge metal studs for partitions from 16'-0" to 18'-0" in height.
 - 2. Where partitions are to have gypsum wallboard on one side only, use 25 gauge metal studs for partitions up to 14'-6" high; use 20 gauge metal studs for partitions from 14'-6" to 17'-3" in height. At these partitions (wallboard at one side), provide continuous cold rolled stiffener channels at third points, secured with screws or by welding. Securing by wiring shall not be accepted.
 - 3. The above gauge requirements are based on 3-5/8 inch deep studs at 16" centers. Metal gauges for studs of different depth or spacings shall be subject to review by the Architect.
- B. Extend partition framing from floor to underside of finish ceilings, to 4" minimum above finish ceilings, or to underside of metal roof deck construction above, as indicated on the Drawings and/or required by field conditions.
- C. Bottom and Top Track Installation:
 - 1. Secure bottom tracks to supporting construction, both ends, corners, jambs of openings, and 24" centers with bolts and metallic expansion sleeves.

2. Where partition framing extends to underside of metal roof deck, secure top track to roof steel framing where perpendicular thereto. Where partitions are parallel to roof steel, brace top track to adjacent building framing with pieces of studs, at 48" O.C., maximum. Fire Safing Insulation Contractor shall furnish safing insulation for top track and where indicated on Drawings and/or required by field conditions.
 - a. Isolate stud system from transfer of structural loading to system, horizontally and vertically. Provide slip type joints to attain lateral support, allowances for deflection, and avoid axial loading.
 3. Where partition framing is ceiling high and ceilings are finished with gypsum wallboard, secure top track through wallboard to ceiling framing, at each intersection.
 4. Where partitions are ceiling high and ceilings are acoustical ceilings, after acoustic panels above partitions are installed, install top track at underside of ceiling grid by bolting the tracks to the grid, separating top track from ceiling with a strip of polyethylene film.
 5. In all areas of ceiling high partition and in areas where framing extends only 4" above finish ceilings, conceal brace the top of the partition to steel framing at 48" O.C., maximum, in the area above the ceilings.
- D. Furnish single length, unspliced studs for all locations. Furnish studs cut short to provide a 1/2" space between top of stud and underside of top track. Secure studs at corners, intersections, ends and both sides of openings to bottom track, at both stud flanges, with screws. In all other locations studs shall twist into tracks so as to be held by friction and to permit differential deflection between top and bottom track support construction. NOTE: In fire-rated walls frame fastening shall be in accordance with code requirements governing fire-rated construction.
- E. Framing:
1. Frame partition corners by butting one wall against the other, with one stud at the end of the abutting wall and with two studs at the end of the other wall, forming a three stud corner.
 2. Frame partition intersections by butting the intersecting wall against the wallboard-finished through-wall, providing two studs at intersection in through-wall, one stud at the end of abutting wall, and bolting stud at end of abutting wall to wallboard of through-wall, at 24" O.C.
 3. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13 mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attached to underside of overhead structure.
 4. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 5. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

6. Control joints shall be framed by placing two studs back to back, with a 1/2" open space between backs, and by interrupting tracks with a 1/2" open space, at the joint.
- F. Completed framing shall provide straight true, plumb planes to receive the gypsum wallboard. Openings shall be true rectangles.

3.03 CEILING AND SOFFIT FRAMING

- A. General: Furnish and install a concealed framing system at gypsum wallboard ceilings (except where noted otherwise), consisting of 1-1/2" runner channels, spaced not over 4'-0" on centers, erected parallel to partitions and walls. Hang suspended ceiling framing from the steel framing above.
- B. Hang runner channels from above the hangers spaced at 48" O.C., maximum, along each channel. Erect hangers approximately plumb. Wrap each wire hanger around the runner channel, the steel joist, and around itself three times. If steel band hangers are used, secure each steel band to the runner channel by wrapping tightly around the channel and bolting to itself. All connections shall develop the full strength of the hangers.
 1. Do not attach hangers to roof deck, ductwork, duct supports, piping, conduit or hangers for same.
 2. Where ductwork or other construction interferes with typical hanger spacing, provide trapezes, or other approved framing, to frame around such items and to support the hangers.
 3. Pairs of diagonal hangers, extending from runner at midpoint between joists to top chord of joists at each side may be provided to reduce hanger spacing to 48" centers or less along the runner.
 4. Provide additional hangers at light fixtures, diffusers, grilles, and other points of extra loading.
- C. Erect runners level, parallel to room walls and parallel to each other. Provide a runner adjacent to, and within 3" of, walls where parallel to same. Provide runners at top and bottom edges of all ceiling drops. Cut off ends of runners 1/2" from walls where perpendicular thereto. Splice, when required, at hangers only, by lapping 12" and securely tying.
- D. Where control joint or expansion joint is required by Drawings or Specifications, and runners are parallel to the joint, provide runner channel at each side of joint and secure each, independently of each other, to the framing above. Where runners are perpendicular to the joint, terminate runners at each side of joint, allowing a 1/2" wide, minimum, break in the runners, aligned with joint.
- E. Frame and brace all openings in ceilings that have any side dimension over 2 ft. as a part of the suspension system. Provide all required metal framing, bracing, supports, blocking and wedging necessary to install the framing rigidly and securely in position. Do all cutting and drilling required to install and fasten framing and furring in place. Erect runners to true lines, levels and planes so as to provide a true, flat, system or surface to receive the succeeding Work.

3.04 METAL FURRING

- A. Furnish and install metal furring to support gypsum wallboard ceilings, ceiling drops, and soffits at the lines and elevations as shown and/or noted on the Drawings.
- B. Erect furring in straight continuous rows and in parallel alignment, spaced 16" O.C. Splice furring, where required, by nesting or lapping adjacent members not less than 8" and by double tying the lap splice.
 1. At ceilings, ceiling drops, and soffits, erect furring at right angles to supporting framing.

2. Where furring is parallel to edges of wallboard finish, provide a furring member at wallboard edge.
 3. Where furring is at right angles to edges of wallboard finish, extend furring to such edges, mitering or coping members at corners.
- C. Where control joint or expansion joint is required provide a furring member at each side of joint, along edge of wallboard.
- D. Provide steel framing, bracing, shimming and supplementary framing as required to erect furring at the required lines and elevations. Secure furring to ceiling framing runners and to building framing by saddle tying with two (2) strands of tie wire.
- E. Direct Metal Stud and/or Furring Channel Attachment to Walls: Where Dampproofing is not indicated and/or specified and metal stud and/or furring channel is installed directly to exterior wall, install felt protection strip between metal stud and/or furring channel and wall. Attach metal furring channels, spaced 24" O.C. maximum unless otherwise as noted on the Drawings, to interior of masonry and/or concrete surfaces with hammer-set or power-driven fasteners staggered 24" O.C. maximum on opposite flanges.

3.05 CLEAN-UP

- A. During progress of the Work, keep the premises free of all debris and waste materials resulting from the Work of this section. During progress of the Work, upon completion of Work, and before final acceptance of the Work, remove all construction debris and rubbish to central area designated for clean-up by the General Contractor. Remove all unused materials, tools, and equipment from site.
- B. Do not allow the accumulation of scraps and debris arising from the Work of this section but maintain the premises in a neat and orderly condition at all times.

END OF SECTION

SECTION 09 28 13CEMENTITIOUS BACKING BOARDS

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, equipment, and services necessary for Cementitious Backing Board Work indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Cement Board and Accessories.
 - 2. Joint Treatment for Interior Cement Board Panels.
- B. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:
 - 1. Metal Stud Framing System for Interior Work - Section 09 22 16.
 - 2. Thin-Set Tile Work - Section 09 31 00.

1.02 QUALITY ASSURANCE

- A. General: All materials, articles, accessories incorporated in the Work shall be type and quality specified herein, and subject to the Architect’s review. Methods of preparation, construction and installation of such materials, articles and accessories shall be strictly in accordance with the accepted standard practices, manufacturer’s printed specifications and/or instructions, the Architect’s Drawings and Specifications, and as directed by the Architect.

1.03 SUBMITTALS

- A. General: Submit Product Data to Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

1.04 DELIVERY AND STORAGE

- A. General:
 - 1. Deliver all materials to the site in their original protective wrappings and/or packages, clearly labeled with pertinent information to facilitate checking. Unload in areas designated by the General Contractor. Damaged or deteriorated materials shall be removed from the premises.
 - 2. When material delivery schedules necessitate delivery of the materials before the building is enclosed, or prior to installation of the materials, provide storage and weathertight protection from damage and exposure to the elements in the form of an enclosed shelter of frame construction, with solid wall sheathing and a pitched roof, for the temporary storage of the materials. A waterproof covering of wallboard in lieu of the temporary building is not acceptable.

- B. Cement Board: When delivered, the cement board panels with unbroken bundling tape shall be neatly piled flat on the floor without overlapping the floor. Storage area shall be protected from the weather.
- C. Material Shelf Life: Do not retain material at the jobsite which has exceeded the shelf life recommended by the manufacturer.

1.05 PROJECT ENVIRONMENTAL CONDITIONS

- A. Interior cement board panel installations; during installation, maintain temperatures in the building within the range of 40°F. to 100°F.
- B. Provide adequate ventilation to carry off excess moisture.
- C. Cement board panels shall not be installed when the board is wet.

1.06 INSPECTION

- A. Carefully inspect all surfaces upon which the Work of this section is to be installed; and notify the General Contractor, in writing, for correction, of any condition, detrimental to the installation of this Work. The installation of any materials of this section will be considered this Contractor's acceptance of the field conditions. Therefore, if any defective Work is covered in, remove and replace the affected Work of this section, without extra cost to the Owner.
- B. Steel stud wall framing to receive cement board panels shall be structurally sound, free from bow, and in general compliance with local building code requirements. Damaged and excessively bowed studs shall be replaced before installation of cement board panels. Framing shall be designed (based on stud properties alone) not to exceed L/360 deflection for tile. Steel stud framing must be 20 gauge or heavier with corrosion-resistant metal coating equivalent to G60 hot-dipped galvanized.

1.07 SCAFFOLDING

- A. Provide, erect, and maintain all scaffolding, ladders, etc., as required by field conditions, all in accordance with the standards of all governing local, state, and national safety codes, as required for the performance of all Work of this section of the Specifications. Such equipment shall be erected at times and locations so as not to delay any part of this or any other Work. When no longer required, promptly dismantle the equipment and remove same from the site.

1.08 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

PART 2 - PRODUCTS

2.01 CEMENT BOARD AND ACCESSORIES

- A. Manufacturer: Products specified herein, unless otherwise indicated, shall be as manufactured by United States Gypsum Company, 550 West Adams Street, Chicago, IL 60661, (800)874-4968; www.usg.com.

- B. Interior Cement Board Panels: DUROCK® Brand Cement Board, thickness as indicated on the Drawings, noncombustible cement backerboard substrate exceeding ANSI A118.9 for cementitious backer units, provided in widths, lengths, and thicknesses as required by Drawings and/or field conditions.
1. Material Composition: Cement board shall be formed in a continuous process of aggregated Portland cement slurry with polymer-coated, glass-fiber mesh completely encompassing edges, back and front surfaces. The edges shall be formed smooth, and ends square cut.
 - a. Strength: High flexural strength, bend resistant to prevent finish cracking. Boards shall have high compressive strength to resist impact damage.
 - b. Surface Finishes: Cement board shall have dual surface finishes; a smooth surface side for mastic applications; and a textured surface side for mortar applications.
 - c. Surface Burning Characteristics: Test method in accordance with ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 1) Flame Spread 0, and Smoke Developed 0.
 - d. Non-Combustibility: Product shall be non-combustible when tested in accordance with ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750° C.
- C. Accessories: Provide accessory items and Prep products as recommended and acceptable with the specified cement board manufacturer.
1. Joint Reinforcement Material: DUROCK™ Brand Interior Tape, not less than 2" wide alkali-resistant glass-fiber mesh tape.
 2. Fasteners: DUROCK™ Brand Screws (No. 8) with corrosion-resistant coating, 8-gauge, wafer head wood and/or steel screws with self-drilling points and countersinking ribs to prevent strip-out. Both wood and/or steel screw types shall have heads with a minimum of 0.40" in diameter; driving recess shall be a No. 2 "Phillips" design. Provide types and of lengths as recommended by cement board manufacturer for installations as indicated on the Drawings and/or required by field conditions.

PART 3 - EXECUTION

3.01 CEMENT BOARD INSTALLATIONS

- A. Interior Walls: Install interior cement board over metal stud framing at locations as indicated on the Drawings to receive wall tile.
- B. General:
1. Inspect the metal stud framing and verify proper placement. Studs shall be straight line, with no protrusions from the line of the studs, such as screws and nail heads, mounting brackets and flanges of electrical outlet boxes. Interior metal stud framing shall be a maximum of 16" O.C.

2. Report to the General Contractor, in writing, any metal stud framing conditions of poor placement, protrusions, or other conditions interfering with the proper installation of cement boards. Installation of cement boards without notification shall be considered Contractor's acceptance of the metal stud framing, and claims for failure of cement board Work because of unsatisfactory framing conditions will not be allowed. Contractor shall be responsible for all faulty Work resulting from improper installation of the cement boards.
- C. Installation: Cement board shall be installed in accordance with the manufacturer's written instructions and as specified herein.
1. Panel Application: Pre-cut board to required sizes and make necessary cut-outs. Fit ends and edges closely but not forced together, leaving a 1/8" gap. Install board abutting top of spacer strip. Stagger end joints in successive courses. Fasten cement board to steel studs spaced maximum 16" O.C. and bottom runners with steel screws spaced 8" O.C. with perimeter fasteners at least 3/8" and less than 5/8" from ends and edges.
 2. Prohibited Fasteners: Do not use drywall screws or drywall nails.
- D. Joint Treatment Application: Prefill all cement board joints, and joints where cement boards abut other panels or surfaces such as gypsum board, with tile-setting mortar or adhesive, and then immediately embed tape and level the joints.

3.02 CLEAN-UP

- A. During progress of the Work, keep the premises free of all debris and waste materials resulting from the Work of this section. During progress of the Work, upon completion of Work, and before final acceptance of the Work, remove all construction debris and rubbish to central area designated for clean-up by the General Contractor. Remove all unused materials, tools, and equipment from site.

END OF SECTION

SECTION 09 29 00GYPSUM WALLBOARD

The requirements of the "General Conditions", the "Supplementary Conditions", and "Division 1" sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, equipment, and services necessary for Gypsum Wallboard Work indicated on the Drawings and/or required by field conditions and specified herein. Work includes, but is not limited to the following:
 - 1. Gypsum Wallboard Materials and Accessories.
 - 2. Gypsum Sheathing Panels.
 - 3. Fire-Rated Wall Construction, where required by Drawings and/or field conditions.
 - 4. Sanding preparation for painting and/or finishing.
- B. Existing Gypsum Board Construction: Repair damaged gypsum wallboard as required by Drawings and/or field conditions in areas of new construction.
- C. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:
 - 1. Rough Carpentry Work - Section 06 10 00.
 - 2. Joint Protection - Section 07 90 00.
 - 3. Pressed Steel Door Frames - Section 08 11 13.
 - 4. Pass-Thru Windows - Section 08 56 19.
 - 5. Non-Structural Metal Stud Framing - Section 09 22 16.
 - 6. Cementitious Backing Boards - Section 09 28 13.
 - 7. Thin-Set Tile Work - Section 09 31 00.
 - 8. Painting and Finishing - Sections 09 91 13 and 09 91 23.

1.02 REFERENCE SPECIFICATIONS

- A. ASTM International Standard Specifications: As referred to herein, and throughout this section.
 - 1. ASTM C11 - Standard Terminology Relating to Gypsum and Related Building Materials and Systems.
 - 2. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

3. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
4. ASTM C1177 - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
5. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing.
6. ASTM C1396 - Standard Specification for Gypsum Board.
7. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750° C.

1.03 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain each type of gypsum board and related joint treatment materials from a single manufacturer.
- B. Fire-Resistance Ratings: Where indicated, provide materials and construction which are identical to those of assemblies whose fire resistance rating has been determined in accordance with ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials, by a testing and inspecting organization acceptable to authorities having jurisdiction.
 1. Design: Provide fire-resistance-rated assemblies identical to those indicated by reference to the current editions of GA File No's in GA-600 "Fire Resistance Design Manual" by the Gypsum Association (GA) or to design designations in Underwriters' Laboratories, Inc. (UL) "Fire Resistance Directory" as indicated on the Drawings.

1.04 SUBMITTALS

- A. General: Submit Shop Drawings and Product Data to Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Product Data: Submit Product Data for each type of product specified.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. General:
 1. Deliver all materials to the site in protective wrappings, clearly labeled with pertinent information to facilitate checking. Unload in areas designated by the General Contractor.
 2. Deliver wallboard materials in manufacturer's unopened containers, packages or bundles identified with manufacturer's name, brand, type and grade. Store inside in dry areas and protect from dampness and deterioration. Protect redi-mixed products from freezing and protect metal accessories from rusting. Remove damaged or deteriorated materials from the premises.
 3. When material delivery schedules necessitate delivery of the materials before the building is enclosed, or prior to installation of the materials, provide weathertight protection in the form of frame construction, with solid wall sheathing and a pitched roof, for the temporary storage of the materials. A waterproof covering of wallboard in lieu of the temporary building is not acceptable.
- B. Gypsum Wallboard: When delivered, the wallboard with unbroken bundling tape shall be neatly piled flat on the floor without overlapping the floor. Storage area shall be protected from the weather.

- C. Material Shelf Life: Do not retain material at the jobsite which has exceeded the shelf life recommended by the manufacturer.

1.06 PROJECT CONDITIONS

- A. Temperature and Humidity Conditions: Do not install wallboard and joint finishing unless installation areas comply with the minimum temperature and ventilation requirements recommended by the manufacturer.
 - 1. Interior room temperature within the building during installation of wallboard shall not be less than 50°F., with adequate ventilation maintained to eliminate excessive moisture until joint compound is completely dry. Protect wallboard from wetting, and replace any damaged material.
- B. Ventilation: Provide ventilation during adhesives and joint treatment applications. Use temporary air circulators in enclosed areas lacking natural ventilation. Under slow drying conditions, allow additional drying time between coats of joint treatment. Protect installed materials from drafts during hot, dry weather.
- C. Acclimation to Environment: Rooms or areas in which Work is to be installed shall be at temperatures as specified herein, twenty-four (24) hours prior to installation to at least five (5) days after completion of installation.
- D. Protection: Protect Work installed by other trades previous to Work under this section. Replace any Work damaged without added cost to the Owner.

1.07 SCAFFOLDING

- A. Furnish, erect, and maintain all scaffolding and ladders in accordance with local, state, and national safety codes. Equipment shall be erected at times and locations so as not to delay any part of Work. When no longer required, promptly dismantle equipment and remove from site.

1.08 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

PART 2 - PRODUCTS

2.01 GYPSUM WALLBOARD MATERIALS AND ACCESSORIES

- A. Gypsum Wallboard: ASTM Standard 48" wide sheets with tapered or rounded (eased) edges, in lengths as long as practical to minimize jointing, of thickness shown on Drawings, as manufactured by United States Gypsum Company, www.usg.com; National Gypsum Company, www.nationalgypsum.com; or G-P Gypsum Corporation, www.gp.com; or comparable manufacturer and equivalent product subject to conformance with these specifications, the requirements of the Drawings and the Architect's review. Provide the following types as required by Drawings and/or field conditions:
 - 1. Standard Gypsum Wallboard: ASTM Standard C1396 (formerly ASTM Standard C36).

2. Type X Fire-Rated Gypsum Wallboard: USG-Sheetrock® Brand, Firecode® Core, Type X Gypsum Panels.
 3. Water-Resistant Gypsum Wallboard: ASTM Standard C1396 (formerly ASTM C630).
 4. Impact-Resistant Wallboard: USG, Mold-Tough™ VHI Firecode X Panels, very high impact-resistant, noncombustible, moisture-resistant gypsum core that is encased in moisture and mold resistant, 100% recycled green face and brown back paper. Complies with ASTM C1396, C1629, D4977 and D5420 Test Standards. Fire Hazard Classification: Flame Spread 15, Smoke Developed 5; in accordance with ASTM E84.
- B. Joint Tape, Joint Cement, and Adhesives:
1. Joint Tape: Perforated paper tape made especially for drywall joint reinforcing, conforming with ASTM C475 - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 2. Joint Cement: Two compound system (joint compound and topping compound) conforming with ASTM Standard C475.
 - a. Provide special joint cement recommended by manufacturer for water-resistant gypsum board.
 3. Adhesives: Provide adhesives conforming to ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing, as recommended by the wallboard manufacturer.
- C. Screws: Phillips head screw fasteners conforming to ASTM Standard C954, with self-drilling point, self-tapping thread, and rust resistant coating, not less than #6 x 1" long, except as otherwise required for fire resistive ratings.
- D. Nails: GWB-54, bright finish, annular ringed nails conforming with ASTM Standard C514 (formerly ASTM Standard C380), of length to provide 3/4" minimum penetration into framing or furring, except as otherwise required for fire resistive ratings.
- E. Corner Beads: Formed to an angle of 90 degrees, zinc-coated steel not lighter than 26 gauge (0.0179 inch in normal thickness) with wings not less than 7/8 inch wide and perforated for screws/nails and cement treatment, or formed of zinc-coated steel or protected aluminum with legs approximately 3/4" wide and cemented under pressure with a rubber base adhesive to tough paper jointing tape wings not less than 1" wide. Zinc-coated steel shall conform to Federal Specification QQ-S-775 Type I, Class C.
- F. Casing Beads: United States Gypsum Company, USG - No. 200-A galvanized metal trim, or equivalent 26 gauge galvanized casing bead by National Gypsum Company.
- G. Control Joints: United States Gypsum Company, USG - Zinc Control Joint No. 093, or equivalent 26 gauge galvanized metal control joint product by National Gypsum Company.
- H. Special Trim: Provide where/if indicated, special trim fabricated from No. 26 gauge galvanized sheet steel to the shape shown on Drawings.
- I. Dust Stop Gaskets: Open Cell "Williams-Everlastic® 1320 Series Polyurethane Foam", not less than 3/8" thick, Charcoal Gray, conforming to ASTM Standard D3574, as manufactured by Williams Products, Inc., 1750 Maplelawn Blvd., Troy, MI 48084, (800)521-9594 or (248)643-6400; www.williamsproducts.net.

2.02 GYPSUM SHEATHING PANELS AND MATERIALS

- A. Manufacturers: Panels specified herein shall be as manufactured by Georgia-Pacific Gypsum LLC, 133 Peachtree Street, Atlanta, GA, 30303, (800)947-4497 or (800)225-6119; www.gpgypsum.com.
- 1. Comparable Products: Gypsum sheathing panels by manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.
- B. Gypsum Sheathing Panels: Square edge, noncombustible, gypsum sheathing panels, in accordance with ASTM Standards E136, C1177 and C1396 (formerly ASTM Standard C79), 5/8" (nominal thickness) DensGlass® Sheathing. Gypsum panels shall be made of a treated, water-resistant core, surfaced with fiberglass mats and a "Gold" colored primer coating. Flame spread/smoke develop rating shall be 0/0 when tested in accordance with ASTM Standard E84.
- C. Accessory Materials:
 - 1. Fasteners: Steel drill screws, in lengths recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating.

PART 3 - EXECUTION

3.01 WOOD NAILERS/BLOCKING

- A. Wood Nailers and Blocking: Wood nailers and blocking where shown on Drawings for gypsum wallboard finish shall be furnished and installed by the Rough Carpentry Contractor.

3.02 GYPSUM WALLBOARD INSTALLATION

- A. General: Furnish and install gypsum wallboard on the exposed side or sides of stud partition framing and cold-formed metal framing, on one side of all furred areas, fire stops, and where shown on Drawings, and as required by field conditions.
 - 1. Unless otherwise indicated on the Drawings, provide multiple-layer wallboard as indicated or required by field conditions for fire-rated partition construction. Provide single layer wallboard for all other locations.
 - a. Comply with ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
 - b. Provide fire-rated gypsum wallboard where indicated on Drawings and/or required by field conditions.
 - c. Provide standard gypsum wallboard at all other areas.
 - 2. Cover full height of stud partition framing with wallboard, including where indicated on the Drawings, the portion above ceilings.
 - 3. In all wall and partition Work, except where partition framings terminate at underside of ceilings, extend wall and partition wallboard up past edge of ceiling wallboard, and cope edge of ceiling wallboard to such vertical surfaces forming a control joint.
 - 4. At all control joints, provide a 1/4" wide, straight open joint in the wallboard, at the joint centerline.

5. In addition to the required fastening of wallboard panels vertically, secure gypsum wallboard at partitions with screws 16" O.C. to bottom and top track.
- B. Fire-Resistance-Rated Assemblies: At Fire-Rated Partition(s), type of screws and spacing of screws shall be in accordance with the U.L. Design designation specified on the Drawings.
- C. Installations:
1. Single Layer Installations:
 - a. If wallboard is obtainable in length to span full height in a single piece, install wallboard with long dimension vertical; otherwise install wallboard with long dimension horizontal; with vertical joints aligned over studs or furring in both cases.
 - b. At soffit/ceiling and soffit/ceiling drop Work, install wallboard with long dimension at right angles to support framing, with end joints aligned over framing members.
 - c. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
 - d. Apply all wallboard with the reverse side against the framing members, and with the separate boards in moderate contact, but not forced into place. At internal and external corners, conceal the cut edge of the boards with the overlapping covered edge of the abutting board. Stagger the boards so that the corners of any four boards will not meet at a common point except in vertical corners.
 - e. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
 2. Double Layer Installations:
 - a. Install and secure the base layer of wallboard in accordance with requirements specified above for single layer installation, except wallboard on walls and partitions may be installed with long dimension horizontal in all cases.
 - b. Apply face layer of wallboard over base layer in same manner and positioning as specified for base layer, off-setting joints not less than 10" from joints of base layer. Secure face layer to base layer with full, uniform coatings of adhesive, applied to both contact surfaces with a brush, roller or serrated spreader. Impact layers together to insure thorough and maximum bonding. Form corners by overlapping board ends of base layer. Provide screw or nail fastening to supplement adhesive fastenings as may be required.
- D. Screw Fastening:
1. Power drive all screws with an electric screwdriver until the screw head provides a slight depression below the surface of the wallboard, but no further. Do not break the paper covering in the board. If the paper surface is broken, place another screw approximately 2 inches from the damaged surface.
 2. Screws shall be spaced a maximum of 8" O.C., and not closer than 3/8" to edges. Pair, not stagger, fasteners at edge joints between adjacent sheets.

3. Fastening for vertical and horizontal application shall begin at the top center of the panel and proceed outward to the edges or ends, with the top completed before proceeding. Fastening the field of the panel shall begin with the member nearest the center of the panel and proceed outward to the edges or ends, with the fastening completed on each member before proceeding to the next member.

E. Nail Fastening:

1. Where wallboard is required to be secured to wood furring member, installation shall be with annular nails. Nailing for vertical and horizontal application shall be as specified for screw fastening above, except with maximum (nail) spacings of 7" O.C. at ceilings, and 8" O.C. at walls.
2. Wallboard may also be secured to wood framing members and furring with screws, in which case, the application shall be as specified for screw fastening above, including maximum screw spacings.

3.03 EXPANSION JOINTS AND CONTROL JOINTS

- A. Expansion Joints: Provide expansion joints where noted on the Drawings and/or required by field conditions. Provide two (2) metal casing beads, back to back, with open space of size detailed on Drawings between backs, at expansion joint centerlines.
- B. Control Joints: Where not indicated on Drawings, gypsum panel surfaces shall be isolated with control joints where partition or furring run exceeds 30 ft.; where soffit/ceiling dimensions exceed 50 ft. in either direction, or area within separate soffit/ceiling sections exceeds 2,500 sq. ft.; where wings of "L", "U", and "T" shaped soffit/ceiling areas are joined; where soffits/ceilings abut partition or vertical surface; and where expansion or control joints occur in base exterior wall. Back joint by double studs or furring channels.
 1. Where soffits/ceilings abut partitions or vertical surfaces, install dust stop gasket (with slight fullness to allow for movement of joint), then install soffit/ceiling wallboard with metal casing bead at exposed edge, forming a 1/8" to 1/4" wide open space between the abutting surfaces. Casing beads shall be flushed with wallboard in same manner as hereinafter specified for edge treatment.
 2. Install at all other control joint locations, approved, roll-formed zinc control joints, attaching with Bostich® 9/16" "G" staples, or approved equal, spaced not over 6" apart. Cut end joints square and align for neat fit. Control joint shall then be given joint finishing treatment as hereinafter specified. Remove protective tape when joint treatment is completed.

3.04 CORNER AND EDGE TREATMENT

- A. Internal Corners: Treat all exposed internal corners, as specified herein under Article for FINISHING. Reinforcing tape shall be folded lengthwise through the middle and fitted neatly into the corner.
- B. External Corners: At external corners neatly fit a corner bead over the corner and secure with the same type screws used for applying wallboard. Space screws approximately 6 inches on centers, driving through the wallboard into the framing member. After the corner piece has been secured in place, treat the corner with joint cement and reinforcing tape in the manner as specified herein under Article for FINISHING. Feather final coat of topping compound out from 12 to 16 inches on both sides of corner.
- C. Edges: Finish all exposed edges of wallboard, including perimeter of all soffit/ceiling areas, and edges abutting masonry, concrete, door frames, window frames, and other finish construction, with metal casing beads. Casing beads shall be flushed with wallboard surface in manner herein before specified for external corners, topping compound feathered out from 12 to 16 inches to surfaces of wallboard. All Work shall be sanded smooth when dry.

3.05 FINISHING

- A. Prefill: Prefill open joints and damaged surface areas.
- B. Tape: Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- C. Levels of Finish: Provide levels of gypsum board finish for locations as follows, in accordance with ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
 - 1. Level 1: Ceiling plenum areas and concealed areas, except provide higher level of finish as required to comply with fire resistance ratings and acoustical ratings.
 - 2. Level 2: Substrate at tile, except remove tool marks and ridges.
 - 3. Level 3: Where heavy- or medium textured finishes or heavy-grade vinyl wallcovering will be used.
 - 4. Level 4: Where smooth flat paints, light textures, or light- or medium-grade wallcoverings.
- D. Special Trim and Reveal Joints: Install as indicated on Drawings and in accordance with manufacturer's instructions.

3.06 GYPSUM SHEATHING PANELS

- A. Preparation: Examine exterior stud framing and verify that the surface of the framing members to receive the sheathing does not vary more than 1/4" from the plane of faces of adjacent members.
 - 1. Inspection: Framing stud spacing shall not exceed 16 inches O.C. for 1/2 inch thick gypsum sheathing panels and 24 inches O.C. for 5/8 inch thick gypsum sheathing panels.
 - 2. Notification: Contact the General Contractor, in writing, for correction, of any condition, detrimental to the installation of this Work.
- B. Sheathing Installation: Provide sheathing where the Drawings and as specified herein. Install sheathing in indicated on accordance with ASTM Standard C1280 and the manufacturer's written installation instructions and recommendations.
 - 1. Fiberglass-faced gypsum sheathing, where indicated on the Drawings, over stud framing shall be installed with the "gold side" out (exposed to exterior view/side).
 - a. Fasteners shall be flush to the face of the board, not countersunk.

3.07 SURFACE PREPARATION FOR PAINTING

- A. Where painting of gypsum wallboard surface is indicated on the Drawings, tape, spackle and sand flush all surface imperfections, cracks, and gouges to make suitable for finish painting by the Painting Contractor.

3.08 CLEAN-UP

- A. During progress of the Work, keep the premises free of all debris and waste materials resulting from the Work of this section. During progress of the Work, upon completion of Work, and before final acceptance of the Work, remove all construction debris and rubbish to central area designated for clean-up by the General Contractor. Remove all unused materials, tools, and equipment from site.

- B. Do not allow the accumulation of scraps and debris arising from the Work of this section but maintain the premises in a neat and orderly condition at all times. In the event of spilling or splashing compound onto other surfaces, immediately remove the spilled or splashed material and all traces of the residue to the approval of the Architect and/or Owner.

END OF SECTION

SECTION 09 31 00THIN-SET TILE WORK

The requirements of the "General Conditions", the "Supplementary Conditions", and "Division 1" sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, equipment, apparatus, tools, transportation, protection and services necessary for, and reasonably incidental to the proper execution and completion of all Thin-Set Tile Work as indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Porcelain Ceramic Floor and Wall Tiles.
 - 2. Special Tile Shapes.
 - 3. Thin Bed Application Method.
 - 4. Medium Bed Application Method for Large Format.
 - 5. Setting Materials, Accessories, and Sealants.
- B. Color Selections: Refer to the Drawings.
- C. Room Finish Schedule: Refer to the Drawings.
- D. Related Sections: The following Work will be provided under other sections of the Specifications:
 - 1. Concrete Floors - Section 03 30 00.
 - 2. Block Masonry - Section 04 20 00.
 - 3. Rough Carpentry - Section 06 10 00.
 - 4. Caulking - Section 07 90 00.
 - 5. Cement Board Panels - Section 09 28 13.
 - 6. Gypsum Wallboard - Section 09 29 00.
 - 7. Resilient Bases and Accessories - Section 09 65 13.
 - 8. Fiberglass Reinforced Plastic (FRP) Panels - Section 09 77 00.
 - 9. Interior Painting - Section 09 91 23.
 - 10. Toilet Compartments - Section 10 21 13.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Requirements of Regulatory Agencies: Furnish and install all Tile Work in strict compliance with the laws, codes, ordinances and regulations of the public authorities having jurisdiction, including Title III of The Americans With Disabilities Act (ADA), Public Law 101-336.
- B. References: Unless otherwise specified herein, all tile materials, installation, and workmanship shall conform to the latest current editions of following:
 - 1. American National Standards Institute (ANSI):
 - a. ANSI A108.5 Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
 - b. ANSI A118.1 Specifications for Dry-Set Portland Cement Mortar.
 - c. ANSI A118.3 Specifications for Chemical-Resistant, Water-Cleanable Tile-Setting and Grouting Epoxy and Water-Cleanable Tile-Setting Epoxy Adhesive.
 - 2. Tile Council of North America, Inc. (TCNA): American National Standards Specifications for Ceramic Tile - ANSI 137.1.
- C. Codes and Ordinances: Where requirements of governing Federal, Local and/or State Codes and Ordinances are more stringent than the requirements specified herein, the requirements of such Codes and Ordinances shall govern, as applicable.

1.03 QUALITY ASSURANCE

- A. General: Contractor for Tile Work shall be responsible for an acceptable completed installation for areas designated to be tiled. Work shall be in complete conformity to the type of tile, dimensions, colors, grades, patterns, and necessary trim units as shown on Drawings and/or required by field conditions.
- B. Installer: Firm shall have specialized in Tile Work for a period of not less than five (5) years of proven successful experience satisfactory to the Architect and/or Owner. Work shall be performed by qualified workmen in a manner conforming to best current practice of the trade.
- C. Performance Requirements: Tiles shall be new materials conforming to performance requirements as specified herein. Materials of "second" quality not meeting or exceeding the requirements of these Specifications shall not be accepted.
- D. Material Shelf Life: Do not retain setting and sealant materials at the jobsite which have exceeded the shelf life recommended by the manufacturer.
- E. Visual Approvals: Obtain Architect and/or Owner's Supervising Engineer acceptance of visual qualities of the Work during progress of the Work before proceeding with the Work.

1.04 SUBMITTALS

- A. General: Submit Product Data, Certificates, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Product Data: For information only, submit two (2) copies of manufacturer's technical information and installation instructions for all materials required, except bulk materials.

- C. Certificates: Before proceeding with the Tile Work, furnish the Architect with a Master Grade Certificate, in the form shown in the TCNA A137.1 signed by the manufacturer and the Contractor certifying the grade, type, and quantity of each kind of tile, together with adequate information for identification of the containers to which they apply.
- D. Sealant Samples: Submit Samples of sealant for review and approval by the Architect. Do not commence Work until the Architect's written approval of the Samples has been received.
 - 1. Submit two (2) Samples of each color required for each sealant exposed to view. Install Sample between two (2) Samples of tile material representative of typical joint widths. Manufacturer's color charts and/or color swatches will not be acceptable as Samples.
- E. Grouting Mortar Samples: Submit two (2) Samples of each color required for review and approval by the Architect. Do not commence Work until written approval from the Architect has been received.
- F. Metal Edge Trim Strip Samples: Submit two (2) 12" long Samples of metal edge trim angle strip for Architect's review and approval.

1.05 PRODUCT DELIVERY, STORAGE AND DELIVERY

- A. Delivery: Deliver all products in original, unopened containers, branded or labeled with the proper grade seal. Mark all containers with designations corresponding with information given on the grade certificates. The containers shall be subject to inspection by the Architect before being opened, as well as during the progress of the Work.
- B. Storage: Store and protect materials within waterproof enclosures to prevent water absorption. Handle materials to prevent damage.

1.06 PROJECT CONDITIONS

- A. Schedule installation of tile with the Owner's Representative to assure completion of all Tile Work, including all protective measures, prior to receipt and installation of Owner supplied fixtures, equipment, furnishings, etc.
- B. When installing tiles and marble over new concrete slabs, do not start installation until concrete has cured for at least five (5) days and then aged for fourteen (14) additional days, or for such additional time as required for the concrete to have shrunk and attained equilibrium.
- C. Install tiles when ambient air temperatures, and temperatures of all materials, is 55°F. or higher. Rooms or areas in which Work is to be installed shall be at temperatures of 55°F. or higher twenty-four (24) hours prior to installation to at least five (5) days after completion of installation.

1.07 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance of the installation.
- B. Systems Guarantee: Obtain from the setting materials manufacturer, a written Systems Guarantee, guaranteeing that the products specified herein shall be free from manufacturing defects and will not break down or deteriorate for a period of not less than five (5) years from the date of the installation, when installed in accordance with the manufacturer's written specifications and guidelines.

PART 2 - PRODUCTS

2.01 PURCHASE BY OWNER

- A. Tile and grout products as specified in the "Responsibilities Chart" noted on the Drawings and in Specification Section 01 64 00 shall be purchase directly by the Owner. No substitutions will be permitted.

2.02 METAL EDGE TRIM STRIPS

- A. Manufacturer: Schluter Systems L.P., 194 Pleasant Ridge Road, Plattsburgh, NY 12901-5841, (800)472-4588; www.schluter.com, or comparable equivalent manufacturer's product subject to review by the Architect.
- B. Product: Edge-protection trim shall be "Schluter®-Reno-Ramp", satin anodized aluminum material, sizes as required by tile thickness. Edge trim shall be ADA compliant.

2.03 SEALANTS

- A. Floor Joint Sealant: DynaTred®, Non-Sag, Traffic-Grade Polyurethane Sealant, two-part, chemically-curing, cold-applied elastomeric sealant, conforming to Federal Specification TT-S-00227E, as manufactured by Pecora Corporation, 165 Wambold Road, Harleysville, PA 19438, (215)723-6051 or (800)523-6688; www.pecora.com.
 - 1. Primer: As recommended by the specified sealant manufacturer.
 - 2. Colors: Sealant color shall match grout joint colors, and shall be subject to review and approval by the Architect and/or Owner.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Surface Inspections: Carefully inspect all surfaces upon which materials will be applied, and report to the General Contractor in writing, any condition detrimental to the installation, for correction prior to proceeding with the Work. The installation of Tile Work will be considered an acceptance of the surfaces to be covered, and claims for failure of Tile and Countertop Work because of unsatisfactory sub-surfaces will not be allowed.
- B. Concrete Floor Slab Tolerance Flatness/Levelness: Floor shall comply with ASTM E1155 - Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers; using the F-Number System.
 - 1. If concrete floor slab surfaces exceed the maximum variation, Tile Contractor shall notify the General Contractor for correction of any defects. Starting Work shall imply acceptance of the job conditions, and an unsatisfactory surface condition for the installation of the materials will not be considered valid in waiving any portion of the warranty.
- C. Masonry Surfaces: For tile on masonry walls, the maximum variation in the masonry surface shall not exceed 1/8" in 8'-0" from the required plane. If the masonry surface exceeds the maximum variation, provide mortar bed from 3/8" to 3/4" or as required to level surface.

3.02 PREPARATION

- A. Prepare all surfaces upon which materials will be applied as required to receive Work. Remove all dirt, grease, oil, paint, and other surface contaminations that will prevent proper bonding from the substrate surfaces. Remove all ridges, fins, projections, high spots and other irregularities that would interfere with proper installation Work.

3.03 LAYOUT, CUTTING, AND FITTING

- A. Layout all Tile Work to minimize cuts of less than one-half tile in size.
- B. Locate cuts to be inconspicuous.
- C. Align all floor joints to have straight, uniform grout lines parallel with adjacent walls and surfaces.
- D. Whenever possible, align grout joints of wall tile and base tile with floor tile joints.
- E. Neatly cut and accurately fit all Tile Work around piping and other installations which pierce the Tile Work; at irregular shaped places; and at the junction with other materials. The surface of the tile shall not be chipped or otherwise be damaged in cutting. Grind cut edges smooth and even.

3.04 WORKMANSHIP AND APPLICATION

- A. General: Install tile as indicated on the Drawings and specified herein.
 - 1. Select tile from the same shade and lot number.
 - 2. Visually inspect the tile prior to installation.
 - 3. Mix tiles from several boxes.
 - 4. Rotate the tiles to ensure a non-repeat look.
- B. Installations: Work shall be performed according to industry standards, manufacturer's written specifications, and reference standards.
- C. Porcelain Ceramic Floor Tile Applications - Thin Bed (Thin Set) Method:
 - 1. Mix the mortar and additive as recommended by manufacturer to achieve the proper working consistency.
 - 2. Apply the mortar with the flat side of the trowel, being sure to work the material into the surface of the substrate. Comb the surface of the mortar with the notched side of the trowel. Use the proper size notched trowel for the size of tile to be installed.
 - 3. Before placing tiles into the fresh mortar, wipe the back of each tile with a damp sponge or "Scotch-Brite™" pad, to remove any dirt or dusty release agents on the tile backs to enhance the bonding strength.
 - 4. Apply mortar to the back of the cleaned tiles to completely cover the back of the tile with a minimum 3/32" to 1/8" uniform thickness.
 - 5. Place the tiles while the mortar is wet and tacky and beat the tile with a rubber mallet and beating block to firmly bed the tiles into the mortar. Occasionally lift a tile off the mortar bed to check for proper coverage of the mortar. Before hardening, excess mortar shall be cleaned with a damp sponge. Tiles may then be grouted when firmly set.

6. Grouting: Exposed joint widths shall be as recommended by tile manufacturer.
 - a. Preparation: Before starting to grout, remove debris in grout joints and lightly sponge the tile surface to remove all dust and dirt. Water shall not be left standing in joints.
 - b. Installation Method:
 - 1) Empty entire contents of packed liquid premeasured kit product jars into a clean pail/container using a clean mixing stick or margin trowel. Mix thoroughly for one minute. Add at least 3/4 of powder product, using more powder for wider joints, as recommended by the manufacturer.
 - 2) Immediately pour entire content of pail/container onto working area. Use standard epoxy grouting techniques to work grout into grout joints. Insure that all grout joints are fully packed.
 - 3) Clean-up by using a hard epoxy rubber grout float at 90° angle to remove as much excess material as possible before initial cleaning with nylon scrub pad. Do not leave excess grout on the face of tiles.
 - 4) Wash the installation within 12 to 24 hours after grouting using a detergent solution such as "Spic and Span®", Trisodium Phosphate, "Ajax®", "Comet®", or non-abrasive cleaner to remove any haze or residue. Do not allow grout film to remain on surface for more than 24 hours.

D. Porcelain Ceramic Floor Tile (Large Format) Applications - Medium Bed Method:

1. Use medium bed mortar for all large format tile (tile with at least one side 15 inches or greater).
2. Mix as recommended by manufacturer. Allow to slake for 5 minutes and then re-mix.
3. Apply the mortar with the flat side of the trowel, being sure to work the material into the surface of the substrate. Comb on additional mortar with the notched side of the trowel. Use 1/2" x 1/2" or 3/4" half loop trowel.
4. Before placing tiles into the fresh mortar, wipe the back of each tile with a damp sponge or "Scotch-Brite™" pad, to remove any dirt or dusty release agents on the tile backs to enhance the bonding strength.
5. Apply mortar to the back of the cleaned tiles to completely cover the back of the tile with a minimum 3/32" to 1/8" uniform thickness.
6. Place the tiles while the mortar is wet and tacky and beat the tile with a rubber mallet and beating block to firmly bed the tiles into the mortar and adjust until level. Occasionally lift a tile off the mortar bed to check for proper coverage of the mortar. Before hardening, excess mortar shall be cleaned with a damp sponge. Tiles may then be grouted when firmly set.
7. Grouting: Exposed joint widths shall be as recommended by tile manufacturer.
 - a. Preparation: Before starting to grout, remove debris in grout joints and lightly sponge the tile surface to remove all dust and dirt. Water shall not be left standing in joints.

b. Installation Method:

- 1) Empty entire contents of packed liquid premeasured kit product jars into a clean pail/container using a clean mixing stick or margin trowel. Mix thoroughly for one minute. Add at least 3/4 of powder product, using more powder for wider joints, as recommended by the manufacturer.
- 2) Immediately pour entire content of pail/container onto working area. Use standard epoxy grouting techniques to work grout into grout joints. Insure that all grout joints are fully packed.
- 3) Clean-up by using a hard epoxy rubber grout float at 90° angle to remove as much excess material as possible before initial cleaning with nylon scrub pad. Do not leave excess grout on the face of tiles.
- 4) Wash the installation within 12 to 24 hours after grouting using a detergent solution such as "Spic and Span®", Trisodium Phosphate, "Ajax®", "Comet®", or non-abrasive cleaner to remove any haze or residue. Do not allow grout film to remain on surface for more than 24 hours.

E. Porcelain Ceramic Wall Tile Applications - Thin Set Method:

1. Mix mortar and additive as recommended by manufacturer until the mortar is creamy and plastic. Adjust quantity of liquid to achieve the proper working consistency. Allow to slake for 5-10 minutes and then re-mix.
2. Apply the mortar with the flat side of the trowel, being sure to work the material into the surface of the substrate. Comb the surface of the mortar with the notched side of the trowel. Use the proper size notched trowel for the size of tile to be installed.
3. Before placing tiles into the fresh mortar, wipe the back of each tile with a damp sponge or "Scotch-Brite™" pad, to remove any dirt or dusty release agents on the tile backs to enhance the bonding strength.
4. Apply mortar to the back of the cleaned tiles to completely cover the back of the tile with a minimum 3/32" to 1/8" uniform thickness.
5. Place the tiles while the mortar is wet and tacky and beat the tile with a rubber mallet and beating block to firmly bed the tiles into the mortar. Occasionally lift a tile off the mortar bed to check for proper coverage of the mortar. Before hardening, excess mortar shall be cleaned with a damp sponge. Tiles may then be grouted when firmly set.
6. Grouting: Exposed joint widths shall be as recommended by tile manufacturer.
 - a. Preparation: Before starting to grout, remove debris in grout joints and lightly sponge the tile surface to remove all dust and dirt.
 - b. Installation Method:
 - 1) Empty entire contents of packed liquid premeasured kit product jars into a clean pail/container using a clean mixing stick or margin trowel. Mix thoroughly for one minute. Add at least 3/4 of powder product, using more powder for wider joints, as recommended by the manufacturer. For grout joints 1/8" to 3/8" wide, use "Non-Sag Additive".

- 2) Immediately pour entire content of pail/container onto working area. Use standard epoxy grouting techniques to work grout into grout joints. Insure that all grout joints are fully packed.
 - 3) Clean-up by using a hard epoxy rubber grout float at 90° angle to remove as much excess material as possible before initial cleaning with nylon scrub pad. Do not leave excess grout on the face of tiles.
 - 4) Wash the installation within 12 to 24 hours after grouting using a detergent solution such as "Spic and Span®", Trisodium Phosphate, "Ajax®", "Comet®", or non-abrasive cleaner to remove any haze or residue. Do not allow grout film to remain on surface for more than 24 hours.
- F. Metal Edge Trim Strips: Verify in field, height dimension of trim product in relation to thickness of the tile and/or mortar bed, and report to the General Contractor, in writing, any discrepancy detrimental to the proper installation of the product. Install specified metal edge trim angles where shown, and as detailed on the Drawings.
1. Installation: Press the perforated anchoring leg of the trim strip into the tile adhesive and align. Trowel tile adhesive over the anchoring leg. Surface of the tile shall level with the top of the trim (the trim shall not be higher than the surface of tile, rather slightly lower - approximately 1/32"). The joint between the tile and the trim (approximately 1/32" - 1/8") shall be filled completely with grout.
- G. Floor Joint Sealant: Provide control joints in floor Work where Tile Work abuts restraining surfaces such as perimeter walls, dissimilar floors, curbs, columns, pipes and where changes occur in backing materials as detailed on the Drawings and/or required by field conditions.

3.05 IMPERFECT TILE WORK

- A. When directed by the Architect, and prior to final acceptance of the Work, remove all broken, chipped, loose or otherwise unsatisfactory installed Tile and Countertop Work.
- B. Patch and restore imperfect tile materials and workmanship to good condition satisfactory to the Architect and/or Owner.

3.06 PROTECTION

- A. Protect installed Work from damage at all times during the progress of the Work.
- B. Properly protect all finished Work from damage that is in place at the time this Work is being done. Tile Contractor shall be responsible, and will be required to pay for all damage to other Work caused by the Contractor's workmen.
- C. Protective covering shall be non-staining multi-purpose building paper with compatible seam tape. Product shall be such as "SealTight® Red Rosin Paper" as manufactured by W.R. Meadows, Inc., P.O. Box 338, Hampshire, IL 60140-0338, (800)342-5976 or (847)214-2100; www.wrmeadows.com, or comparable equivalent product subject to review by the Architect.

3.07 CLEANING

- A. During progress of the Work, keep the premises free of all debris and waste materials resulting from the Work of this section. Remove all debris and rubbish from the site. Upon completion and before final acceptance of the Work, remove all debris, rubbish, unused materials, tools, and equipment from the site.

- B. When directed by the Architect, after the Work of other trades is substantially completed, remove and dispose of protective coverings and thoroughly clean all Work installed under this section. Use of acid will not be permitted. Use clean water in initial cleaning. Remove all stains, excessive mortar, etc.
- C. Cleaner shall be a neutral, general, all-purpose cleaner free of acids, alkalies and abrasives such as one of the following:
 - 1. Tile & Stone Cleaner by Miracle Sealants Company, 12318 Lower Azusa Road, Arcadia, CA 91006-5872, (800)350-1901 or (626)443-6433; www.miraclesealants.com.
 - 2. Super Shine-All® by Hillyard, Inc., 302 North 4th. Street, P.O. Box 909, St. Joseph, MO, 64501, (816)233-1321 or (800)365-1555; www.hillyard.com.

END OF SECTION

SECTION 09 51 13ACOUSTICAL PANEL CEILINGS

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, equipment, and services necessary for Acoustical Ceiling Work indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to, the following:
 - 1. Furnish and Install:
 - a. Acoustical Ceiling Panels.
 - b. Exposed Metal “T” Grid Suspension Systems.
- B. Color Selections: Refer to the Drawings.
- C. Room Finish Schedule: Refer to the Drawings.
- D. Related Sections: The following items of related Work will be provided in other sections of the Specifications as indicated:
 - 1. Rough Carpentry - Section 06 10 00.
 - 2. Gypsum Wallboard Construction - Section 09 22 16.
 - 3. Acoustic Insulation - Section 09 81 00.
 - 4. Metal Building Systems - Section 13 34 19.
 - 5. Mechanical Work - Divisions 21 and 23.
 - 6. Electrical Work - Division 26.

1.02 QUALITY ASSURANCE

- A. General: Firm shall be a qualified, experienced installer of acoustical ceiling panels and suspension systems.
- B. Acoustical Ceiling Panels and Suspension System: Unless otherwise specified and/or indicated on the Drawings, obtain each type of acoustical ceiling panels and suspension system materials from a single manufacturer’s source with resources to provide product of consistent matching quality in appearance and physical properties.

1.03 SUBMITTALS

- A. General: Submit Product Data and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

- B. Product Data: Submit Product Data for each manufacturer's factory/shop fabricated product specified under Work of this section.
- C. Samples: Submit duplicate Samples of all materials specified herein for approval PRIOR to installation. Written approval must be secured in writing from the Architect. Installed materials shall match approved Samples.
- D. Requests for Approval: Approval requests must be accompanied with the Samples. Under no circumstances is any ceiling panel or system to be installed without prior written approval from the Architect.

1.04 PROJECT CONDITIONS

- A. General: Contractor shall take all necessary field measurements to assure proper fitting of the Work to the actual conditions at the building. Examine the position of all recessed lighting and mechanical fixtures on the Drawings, and lay-out the Work accurately to fit the fixture plan.

1.05 SCAFFOLDING

- A. Furnish, erect, and maintain all scaffolding complying with code requirements. Erect at times and locations so as not to delay any part of Work. When no longer required, scaffolding shall be promptly dismantled and removed from the site.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver only acceptable materials to the site in original boxes, crates, wrappings, clearly labeled with all pertinent information to facilitate checking at the site.
- B. Storage: Store the materials at the site, off the ground and in properly protected dry storage facilities, until ready for use. Damaged materials will not be accepted, and shall be removed from the site.

1.07 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance of the installation.

1.08 MAINTENANCE MATERIALS

- A. Extra Materials: Furnish to the Owner's Representative, after the Owner has taken occupancy of the building, additional ceiling panels, boxed, sealed and clearly labeled for Owner's maintenance forces.
- B. Furnish the following quantities of each type and size of panel installed.
 - 1. Ceiling Panels: Furnish not less than twenty (20) panels, two (2) unopened boxes.

PART 2 - PRODUCTS

2.01 ACOUSTICAL CEILING PANELS

- A. Standard Ceiling Panels (CP-1): Cortega Lay-in panels, Item Number 769, 24" x 48" 5/8" thick, factory finished wet-formed mineral fiber boards, medium texture, with factory-applied latex paint surface finish as manufactured by Armstrong World Industries, Inc., 2500 Columbia Avenue, P.O. Box 3001, Lancaster, PA 17603, (800)448-1405, (717)397-0611 or (877)276-7876; www.armstrong.com.
1. Comparable Products: Ceiling panels by the following manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Owner's and Architect's review.
 - a. CertainTeed Corporation, 750 East Swedesford Road, P.O. Box 860, Valley Forge, PA 19482, (610)341-7000 or (800)233-8990; www.certainteed.com.
 - b. USG Interiors, Inc., LLC, subsidiary of USG Corporation, 550 West Adams, Chicago, IL 60661, (800)950-3839 or (312)436-4000; www.usg.com.
 2. Color: Manufacturer's Standard White.
 3. Panel Performance:
 - a. N.R.C. (Noise Reduction Coefficient): 0.55.
 - b. C.A.C. (Ceiling Attenuation Class): Minimum 35.
 - c. Flame Spread/Fire Resistance: Class A Fire Rating: Flame Spread 25 or less (U.L. Labeled) and Smoke Developed Index of 50 or less per ASTM Standard E1264.
 - d. Light Reflectance: Average Light Reflect minimum 0.80, per ASTM Standard E1264.
- B. Ceiling Panels (CP-2): Rockfon Artic, smooth texture, nondirectional, Item Number 620, 5/8" thick, 24" x 24" Square Tegular Narrow lay-in panels, stone wool (mineral wool) with factory-applied latex paint on glass scrim surface as manufactured by Rockfon, 4849 S. Austin Ave., Chicago, IL 60638, (800)323-7164, www.rockfon.com.
1. Color: Manufacturer's Standard White.
 2. Panel Performance:
 - a. N.R.C. (Noise Reduction Coefficient): 0.75.
 - b. Fire Performance: Class A Fire Rating.
 - c. Light Reflectance: 0.85 minimum per ASTM Standard E1264.

2.02 SUSPENSION SYSTEMS

- A. Manufacturers:
1. Armstrong World Industries Inc., Lancaster, PA.; www.armstrong.com.
 2. Chicago Metallic® Corporation. 4849 South Austin Avenue, Chicago, IL 60638, (800)323-7164 or (708)563-4600; www.chicago-metallic.com.

3. USG Interiors, Inc., LLC subsidiary of USG Corporation, Chicago, IL (DONN® Brand); www.usg.com.
- B. Exposed Metal "T" Grid Suspension Systems: Exposed interior lay-in ceiling panels shall consist of formed double web steel main beams and cross tees conforming to ASTM Standard C635 "heavy duty" classification. Deflection of any component shall not exceed L/360 of span. Unless otherwise indicated, specified grid systems or comparable equivalent products shall be subject to conformance with these Specifications and the Architect's review.
1. CP-1 Ceiling Grid: Armstrong Prelude 15/16" Grid System.
 2. CP-2 Ceiling Grid: Armstrong Suprafine XL 9/16" Grid System.
 3. Main Beams and Cross Tees: Main beams shall be capable of supporting not less than 16 pounds per lineal foot over a 4 foot simple span. Cross tees which intersect the main beams, and which support other cross tees shall be capable of supporting a minimum of 12 pounds per lineal foot over a 4 foot simple span.
 4. Tee Caps: Unless otherwise specified, members shall have prefinished enameled steel tee capping of color matching the ceiling panels.
 5. Edge Trim Moldings: Unless otherwise specified, provide enameled, hemmed edge wall moldings of color matching the ceiling panels.
 6. Finish: All steel roll-formed parts shall be chemically cleaned, electrogalvanized, conversion coated, then finished with manufacturer's standard paint.
- C. Hangers: Annealed zinc coated steel wire, No. 12 gauge minimum, unless otherwise noted or specified.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Suspension systems for new acoustical ceilings shall extend to the building structure. Do not hang a new ceiling from any existing ceiling suspension system.
- B. Layout: Ceiling areas shall be laid out as indicated on the Drawings. Unless otherwise indicated or specified, center layout to provide largest size border units possible, not less than 1/2 panel size. Run all main beams of grid system continuous, avoiding diffusers and registers.
- C. Coordination: Contractor shall coordinate his efforts with the Mechanical, Electrical and Sprinkler Contractors for proper support and spacing of grid to work with diffusers, grilles, light fixtures and sprinkler heads.
- D. Cooperation: Contractor shall cooperate with all other Trades to provide allowance for required Mechanical and Electrical Work.
- E. Quality: All installed suspension systems and ceiling panels shall produce true level planes, and be in perfect alignment.

3.02 EXPOSED "T" GRID SUSPENSION SYSTEMS

- A. General: Furnish and install exposed "T" grid suspended system to support all acoustical panel ceilings. Erect suspended grid system in locations as shown on the Drawings. The finished acoustical ceiling system shall be leveled within a tolerance of 1/8" in 12 feet. Main and cross runners of the suspension system shall be straight and true within a tolerance of 1/8" in 12 feet. Installation shall be in accordance with ASTM Standard C636, the current bulletin of the Acoustical and Insulating Materials Association (AIMA), the manufacturer's printed specifications, and as specified herein.

1. Exposed Metal "T" Grid Suspension Systems:

- a. Space hangers for all suspended grid system ceilings not over 4'-0" O.C. Provide splayed hangers or intermediate hangers from supplemental steel where joist spacing is greater than 4'-0". Use #12 hanger wires 4'-0" O.C. for support of acoustic ceiling only.
- b. Do not secure hangers to metal roof deck, ducts, duct hangers, or conduit. Where ductwork interferes with hangers, furnish and install extra hangers, and a trapeze or other approved arrangement, to support runners independently of ductwork. Erect hangers in a plumb position.
- c. Where light fixtures run parallel to and directly under the main beam of the grid system, use #9 wire hangers 4'-0" on center.
- d. Where light fixtures run parallel to main beams but do not come directly under them, provide an additional main beam. Hang main beam separately with #12 wire hangers 4'-0" O.C.
- e. Where light fixtures run perpendicular to the main beams of the grid system, the main beams shall be supported directly above each row of fixtures, with #12 wire hangers in addition to the normal hangers at 4'-0" centers.
- f. Where light fixtures are recessed in ceiling grid provide a #12 wire hanger at each corner of the grid supporting the light fixtures.
- g. Edge trim moldings shall be installed around entire perimeter of room walls and at juncture of ceiling with all columns and similar vertical surfaces.

3.03 ACOUSTICAL CEILING PANEL INSTALLATION

- A. General: Install acoustical ceiling systems in strict accordance with manufacturer's recommendations and specifications.
- B. Cutting and Fitting: Neatly cut and fit ceiling panels around any items occurring in the ceiling.
- C. Hold-Down Clips: Furnish and install hold-down clips, as/if required, one (1) per each side of panel for the following:
1. First panels adjacent to Entrance Doors.

3.04 DAMAGED WORK

- A. Following the installation, all soiled, discolored, damaged or defective Work shall be replaced by new Work. All other Work which becomes damaged during replacement Work shall be repaired by Acoustical Ceiling Contractor. Patched Work will not be accepted.

3.05 CLEAN-UP

- A. Work Required: Clean-up any Work soiled in the performance of the Work under this section.
- B. Debris and Waste Materials: During progress of the Work, keep the premises free of all debris and waste materials resulting from the Work of this section. At the end of each day's Work, upon completion of Work, and before final acceptance of the Work, remove all debris and rubbish to central area designated for general clean-up by the General Contractor, or, if directed by the General Contractor, remove and legally dispose off site.
- C. Unused Materials, Tools, and Equipment: Upon completion and before final acceptance of the Work, remove all debris, rubbish, unused materials, tools, and equipment from the site.

END OF SECTION

SECTION 09 65 13RESILIENT BASES AND ACCESSORIES

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, equipment, and services necessary for Resilient Bases and Accessory Work indicated on the Drawings and specified herein. Work includes, but is not limited to the following:
 - 1. Rubber Wall Bases.
- B. Color Selections: Refer to the Drawings.
- C. Room Finish Schedule: Refer to the Drawings.
- D. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:
 - 1. Cast-in-Place Concrete - Section 03 30 00.
 - 2. Rough Carpentry Work - Section 06 10 00.
 - 3. Gypsum Wallboard Construction - Section 09 29 00.
 - 4. Thin-Set Tile Work - Section 09 31 00.
 - 5. Interior Painting and Finishing - Section 09 91 23.

1.02 QUALITY ASSURANCE

- A. General: All material incorporated in the Work shall be subject to the Architect’s and Owner’s review. Methods of preparation, construction, and installation shall be in accordance with manufacturer’s printed specifications, unless otherwise directed by the Owner’s Representative.
- B. Unacceptable Materials: Material containing asbestos fibers are prohibited.

1.03 SUBMITTALS

- A. General: Submit Product Data and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Product Data: Submit Product Data for each manufacturer’s factory/shop fabricated product specified under Work of this section.
- C. Samples: Submit Samples of all materials for approval PRIOR to installation. Installed materials shall match approved Samples.

1. Submit the following Samples of each type, color and pattern required:

- a. Accessories: 12" long Samples of items such as wall bases.

1.04 DELIVERY AND STORAGE

- A. Delivery: Deliver only approved materials to the site in original boxes, crates, wrappings, clearly labeled with pertinent information to facilitate checking.
- B. Storage: Store the materials at the site off the ground and in properly protected dry storage facilities, until ready for use. Damaged materials will not be acceptable, and shall be removed from the site.
- C. Material Shelf Life: Do not retain material at the jobsite which has exceeded the shelf life recommended by the manufacturer.

1.05 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expenses any imperfections which may develop during the period specified, and damage to other Work caused by imperfections or repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

1.06 MAINTENANCE MATERIALS

- A. Extra Materials: At completion of the Work, deliver to Owner's Representative, additional replacement materials, in unopened boxes, sealed, and clearly labeled for maintenance purposes, in the following amounts:
1. Rubber Wall Bases: One box totaling not less than 16 lineal feet of each base type, size and color installed. Bases shall be of equal lengths not less than 4'-0".

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Products - General: Provide products by the following manufacturer.
1. Johnsonite®, 16910 Munn Road, Chagrin Falls, OH 44023, (800)899-8916 or (440)543-8916; www.johnsonite.com.

2.02 MATERIALS

- A. Rubber Wall Bases: Top set, cove type, 6" high (unless otherwise noted on Drawings) rubber base, formed of 1/8" gauge thick material, as manufactured by Flexco® Corporation, Johnsonite®, Roppe Corporation, or other comparable equivalent manufacturer's product subject to review by the Architect. Provide premolded outside corner base units where required by Drawings or Project conditions.
1. Colors: As noted on the Drawings.
- B. Patching Compound: Fast patch compound brand name product of type recommended by the manufacturer of the resilient base and flooring accessory material.

- C. Adhesives: Cutback or clear thinspread type products as recommended by the manufacturer of the resilient base and flooring accessory materials. Waterproof adhesives shall be used without adulteration. Floor tile adhesive shall not be used for wall bases, and wall base adhesive shall not be used for reducer and transition strip Work.

PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION

- A. Inspection: Carefully inspect all surfaces upon which resilient flooring base materials are to be applied. Notify the General Contractor for correction of any defects. Starting Work shall imply acceptance of the job conditions, and an unsatisfactory surface condition for the installation of the materials will not be considered valid in waiving any portion of the warranty.
 - 1. Concrete surfaces to receive resilient flooring accessory materials shall be smooth and of uniform steel trowel finish, free of curing or sealing compounds.
- B. Preparation: Resilient bases and accessories shall not be laid on uncured or damp concrete. All concrete surfaces receiving resilient flooring materials shall be tested for dampness prior to installation of the flooring material. The following test may be used, or alternate methods as recommended by the resilient flooring manufacturer may be substituted.
 - 1. Test Method for Dampness: Brush on floor primer in several areas as required, preferably in area least subject to drying conditions. If after twenty-four (24) hours the primer can be scraped or peeled from the surface, the surface is unsuitable for installation of the resilient flooring material. Allow surface to dry further; retest until primer is well bonded to the surface, whereupon installation may proceed.
 - 2. Concrete Floor Preparation: Concrete subflooring to receive resilient flooring accessory materials shall be prepared in accordance with the manufacturer's printed instructions and recommendations.

3.02 INSTALLATION

- A. General: Install all resilient flooring base materials specified herein and as indicated on the Drawings in accordance with the manufacturer's printed specifications.
- B. Wall Bases: Install premoulded wall bases including external and internal corners, coped neat and sharp.
 - 1. Carpeted Areas: Coordinate Work with Carpeting Contractor for wall bases required in carpeted areas.
 - 2. Prefabricated Cabinet Toe Boards: Install wall bases for exposed toe bases of prefabricated base cabinets.

3.03 CLEANING PROTECTION

- A. General: Soon after installation of resilient bases and accessory materials, wipe-off all surplus adhesive and leave surfaces clean and free of surface marks or blemishes. All Work shall be thoroughly cleaned at time of completion, at the final completion of the building interior areas, and prior to occupancy when directed by the Architect.

- B. Washing: Resilient base and flooring accessory materials shall not be washed until time period recommended by resilient flooring materials manufacturer has elapsed, to allow materials to become well-sealed in adhesive.
- C. Cleaning, Rinsing, and Sweeping: Clean and rinse all resilient bases and accessories with 140°F. water, and dry. Sweep clean with untreated yarn broom.
- D. Protection: Protect all traffic areas of resilient flooring accessories with undyed, untreated building paper.

3.04 DAMAGED WORK

- A. All damaged or Defective Work shall be replaced. All other Work which becomes damaged in replacing Defective Work shall be replaced by the Resilient Base and Flooring Accessory Materials Contractor. Patched Work will not be accepted.

3.05 CLEAN-UP

- A. During progress of the Work the premises shall be kept free of all debris and waste materials resulting from the Work of this section. All debris and rubbish shall be removed from the site. Upon completion of Work and before final acceptance of the Work, all debris, rubbish, unused materials, tools, and equipment shall be removed from the site.

END OF SECTION

SECTION 09 77 00SPECIAL WALL SURFACING
(FIBERGLASS REINFORCED PLASTIC PANELS)

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, equipment, apparatus, tools, transportation, protection and services necessary for, and reasonably incidental to the proper execution and completion of all Fiberglass Reinforced Plastic (FRP) Panel Work, as indicated on the Drawings and specified herein.
- B. Room Finish Schedule: Refer to the Drawings.
- C. Related Sections: The following items of related Work will be provided in other sections of the Specifications, as indicated:
 - 1. Joint Protection - Section 07 90 00.
 - 2. Gypsum Wallboard Construction - Section 09 29 00.
 - 3. Thin-Set Tile Work - Section 09 31 00.
 - 4. Resilient Bases - Section 09 65 13.

1.02 QUALITY ASSURANCE

- A. General: All materials, articles, accessories incorporated in the Work shall be type and quality specified herein, and subject to the Architect’s review. Methods of preparation, construction and installation of such materials, articles and accessories shall be strictly in accordance with the accepted standard practices, manufacturer’s printed specifications and/or instructions, the Architect’s Drawings and Specifications, and as directed by the Architect.
- B. Manufacturer: Obtain fiberglass reinforced panels, moldings and all other associated accessories from a single manufacturer.
- C. Installer Qualifications:
 - 1. At least five (5) years experience in the installation of fiberglass reinforced plastic panels.
 - 2. Experience on at least five (5) projects of similar size, type and complexity as this Project.
 - 3. Employer of workers for this Project who are competent in techniques required by manufacturer for installation indicated.

1.03 SUBMITTALS

- A. General: Submit Shop Drawings, Product Data, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.
- C. Product Data: Submit sufficient manufacturer's data to indicate compliance with these Specifications, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- D. Samples: Submit two (2) Samples of specified materials to the Architect for approval PRIOR to installation. Written approval shall be secured in writing from the Architect and installed materials shall match approved Samples.
 - 1. Submit the following Samples:
 - a. Panels: 8" x 10" Samples.
 - b. Trim and Moldings: 10" piece of each type of trim and molding.
 - c. Fasteners: Each type as required for complete and finished installation.

1.04 JOB CONDITIONS

- A. Field Measurements: Contractor shall take all field measurements to assure proper fitting of the Work to actual jobsite conditions.

1.05 DELIVERY AND STORAGE

- A. Delivery: Deliver only acceptable materials to the site in original boxes, crates, and factory packaged wrappings, on strong pallets, clearly labeled with all pertinent information to facilitate checking.
- B. Storage: Store materials at the site, off the ground in properly protected cool and dry storage facilities, until ready for use. Store panels and trim lying flat, under cover and protected from the elements. Damaged materials will not be accepted, and shall be removed from the site.

1.06 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form warranting all materials to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance of the installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer: Fiberglass panels and accessories specified herein shall be Building Products as manufactured by Crane Composites, Inc., (formerly known as Kemlite Co.), 23525 W. Eames, Channahon, IL 60410, (815)467-8600 or (800)435-0080; www.cranecomposites.com.
- B. Comparable Products: FRP Panels by the following manufacturer with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.
 - 1. FRP Wall Panels: Marlite® STANDARD™ FRP Panels by Marlite, 202 Harger Street, Dover, OH 44622, (330)343-6621 or (800)377-1221; www.marlite.com.

2.02 FIBERGLASS REINFORCED PLASTIC (FRP) PANELS

- A. FRP Wall Panels: Glasbord® Smooth Wall Panels, Product Code PSIF, complying with ASTM D5319-Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels. Wall panels shall be Class C fire rated, moisture, stain, and impact resistant, fiberglass reinforced plastic panels with a pebble-like embossed textured surface finish on the exposed wear side and smooth surface on backside. Color as specified herein, shall be uniform throughout.
 - 1. Panel Sizes: 4'-0" wide by longest lengths as required by Drawings and/or field conditions.
 - 2. Thickness: 0.09" nominal.
 - 3. Dimensional Tolerances:
 - a. Width: Plus/minus 1/8".
 - b. Length: Plus/minus 1/8".
 - c. Squareness: Plus/minus 1/8" out of square in 48" of width.
 - 4. Certifications:
 - a. UL Classified: Class C, Flame Spread 200 or less, Smoke Developed 450 or less, per ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 5. Color: Selected from manufacturer's standard color charts submitted to the Architect.
- B. Accessories: Where required by Drawings and/or field conditions, include furnishing all matching corner trim, edges, dividers, fasteners, and the following:
 - 1. Moldings: Extruded PVC (polyvinyl chloride) trim and moldings with integral matching color.
 - 2. Adhesive and Sealant: VOC compliant, nonflammable, adhesive and silicone sealant as recommended by the FRP panel manufacturer.
 - 3. Fasteners: Non-staining nylon drive rivets.
 - a. Match panel colors.
 - b. Length to suit Project conditions.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.
 - 1. Verify that stud spacing does not exceed 24 inch on –center.
- B. Repair defects prior to installation.
 - 1. Level wall surfaces to panel manufacturer's requirements. Remove protrusions and fill indentations.

3.02 INSTALLATION

- A. Furnish and install fiberglass reinforced plastic wall panels and all accessories on backing materials as called for on the Drawings.
- B. Fiberglass reinforced plastic wall panels and accessories should be allowed to equalize to the moisture in the room environment and acclimate to room temperature (70°) for at least forty-eight (48) hours prior to installation. Install panels on solid backing which is clean, dry, solid, straight, and free from surface irregularities or projections. Do not joint FRP panels directly over drywall joints. Install wall panel system in accordance with approved Shop Drawings and manufacturer's printed instructions on recommended procedures and installation sequence.
- C. Install flexible sealant at all joints. Cut out for plumbing faucet and taps as required.

3.03 CLEAN-UP

- A. Work Required: Clean-up or repair adjacent finish Work which is soiled, marred, or damaged by the Work of this section, at Contractor's expense.
- B. Debris and Waste Materials: During progress of the Work, the premises shall be kept free of all debris and waste materials resulting from the Work of this section. During progress of the Work, upon completion of Work, and before final acceptance of the Work, remove all debris and rubbish from the site and dispose of legally. Upon completion and before final acceptance of the Work, all debris, rubbish, unused materials, tools, and equipment shall be removed from the site.

3.04 CLEANING

- A. Remove excess sealant from panels and moldings. Wipe panels down using a damp cloth and mild soap solution or cleaner.
- B. Refer to manufacturer's specific cleaning recommendations. Do not use abrasive cleaners.

END OF SECTION

SECTION 09 81 00ACOUSTIC INSULATION

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, and services necessary for Acoustic Insulation Work indicated on the Drawings and/or required by field conditions, and as specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Acoustic Wall and Ceiling Insulation. (Interior Noise Barrier Batts).
- B. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:
 - 1. Acoustical Sealant - Section 07 90 00.
 - 2. Non-Structural Metal Stud Framing - Section 09 22 16.
 - 3. Gypsum Wallboard Construction - Section 09 29 00.
 - 4. Acoustical Panel Ceilings - Section 09 51 13.

1.02 QUALITY ASSURANCE

- A. General: All materials, articles, accessories incorporated in the Work shall be type and quality specified herein, and subject to the Architect’s review. Methods of preparation, construction and installation of such materials, articles and accessories shall be strictly in accordance with the accepted standard practices, manufacturer’s printed specifications and/or instructions, the Architect’s Drawings and Specifications, and as directed by the Architect.

1.03 SUBMITTALS

- A. General: Submit Product Data, Samples and manufacturer’s literature to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Product Data: Unless otherwise indicated, submit the following for each type of product provided under Work of this section.
- C. Manufacturer’s Literature: Submit three (3) sets of manufacturer’s specification data for type of insulation specified herein.

1.04 MATERIAL DELIVERY, STORAGE AND HANDLING

- A. General: Protect insulation from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer’s recommendations for handling, storage and protection during installation.

- B. Delivery: Deliver only acceptable materials to the site in original boxes and wrappings, clearly labeled with all pertinent information to facilitate checking, including material name, production date and/or product code.
- C. Storage: Store materials at the site off the ground and in properly protected dry storage facilities, until ready for use. Provide a tarpaulin covering over the materials, securely tied down. Wet, damp, or damaged materials shall not be used.

1.05 SCAFFOLDING

- A. Furnish, erect, and maintain all scaffolding and ladders in accordance with applicable code requirements. Erect at times and locations so as not to delay any part of the Work, and promptly remove when no longer required.

1.06 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form warranting all materials and workmanship to remain in serviceable and satisfactory condition, and make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

PART 2 - PRODUCTS

2.01 ACOUSTIC INSULATION

- A. Manufacturer: Insulation specified herein shall be as manufactured by Owens Corning Insulating Systems, LLC, One Owens Corning Parkway, Toledo, OH 43659, (800)438-7465 or (419)248-8000; www.owenscorningcommercial.com.
 - 1. Insulation: Commercial quality Owens Corning® Sound Attenuation Batt (SAB) Insulation. Provide lightweight, flexible glass fiber acoustical insulation for interior wall partitions as indicated and noted on the Drawings.
 - 2. Type: Sound Attenuation Batts, unfaced glass fiber acoustical insulation complying with ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; Type I.
- B. Comparable Products: Acoustic Insulation by manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review and Tenant's approval.
- C. Batt Size: Provide not less than 3-1/2" thick insulation and of width and length as required by framing member spacings indicated on Drawings.
- D. Surface Burning Characteristics: Fire hazard classification when tested in accordance with ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 1. Maximum Flame Spread: 10.
 - 2. Maximum Smoke Developed: 10.
- E. Combustion Characteristics: Noncombustible when tested in accordance with ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750° C.

- F. Fire Resistance Ratings: Wall assemblies containing Sound Attenuation Batts (SAB) shall achieve fire resistance ratings in accordance with ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- G. Sound Transmission Class: Sound transmission coefficient shall be not less than STC 44, as measured in accordance with ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- H. Dimensional Stability: Linear shrinkage less than 0.1%.

PART 3 - EXECUTION

3.01 ACOUSTIC INSULATION INSTALLATION

- A. General: Install sound attenuation batt (SAB) insulation at interior wall partitions and ceilings as indicated on the Drawings. Where shown and/or noted on the Drawings; noise barrier batts of fiberglass insulation are to extend full height of wall, and onto ceiling(s) contiguous to wall for a distance of 4'-0".
- B. Inspection and Preparation:
 - 1. Examine substrates and conditions under which insulation Work is to be performed.
 - 2. Provide the General Contractor a written report listing conditions detrimental to performance of Work in this section. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.
 - 3. Clean substrates of substances harmful to insulation.
- C. Installation-General:
 - 1. Comply with manufacturer's instructions for particular conditions of installation as required by the Drawings and/or field conditions.
 - 2. Sound Attenuation Batts may be friction-fit in place until the interior finish is applied. Install batts to fill entire stud cavity. If stud cavity is less than 96" in height, cut lengths to friction fit against floor and ceiling tracks. Penetrations in walls shall have insulation carefully cut to fit around outlets, junction boxes and other irregularities.
 - 3. Where walls are not finished on both sides or insulation does not fill the cavity depth; supplementary support shall be provided to hold insulation in place.
 - 4. Where insulation must extend higher than 8 feet, temporary support shall be provided to hold insulation in place until finish material is applied.
 - 5. Place acoustical insulation tight within space, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
 - 6. Install electrical box pads with pads molded and pressed on back side of box, closing openings, in accordance with manufacturer's instructions, for complete acoustical barrier.

- D. Installation Over Acoustical Ceilings: Install insulation over acoustical ceilings as indicated on the Drawings and specified herein. Insulation shall be laid perpendicular to the cross tees with the grid suspension system supporting the weight of the insulation. Install sound attenuation blankets over ceiling panels and tightly fit around recessed lighting fixtures, ductwork, hangers, conduit and other penetrants.
- E. Protection: Protect installed insulation as recommended by the insulation manufacturer.

3.02 CLEAN-UP

- A. Work Required: Clean-up any Work soiled in the performance of the Work under this section.
- B. Debris and Waste Materials: During progress of the Work, upon completion of Work, and before final acceptance of the Work, keep the premises free of debris and waste materials resulting from Work of this section. Remove all construction debris and rubbish to central area designated by the General Contractor, for general clean-up by the General Contractor, or if directed by the General Contractor to remove from the site and legally dispose.
- C. Unused Materials, Tools, and Equipment: Upon completion of Work and before final acceptance of the Work, remove all unused materials, tools, and equipment from the site.

END OF SECTION

SECTION 09 91 13EXTERIOR PAINTING AND FINISHING

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, tools and equipment, protection, and services necessary for Painting and Finishing Work on new and existing construction as required for surfaces indicated on the Drawings and specified herein. Work includes, but is not limited to the following:
1. General: Preparation of surfaces for painting and finishing.
 2. Exterior Surfaces: Application of paint or special coating for the following exposed to view surfaces:
 - a. Ferrous Metal Work.
 - b. Galvanized Ferrous Metals.
 - c. Gas Piping and Electrical Conduit, as required.
 - d. Concrete Surfaces as indicated and/or specified.
 3. Mechanical Equipment/Work Painting: Coordinate painting requirements with the Mechanical Contractor. Finish paint as required, all exposed to view exterior Mechanical equipment and/or Work not subsequently covered with other finish materials, except for piping identification.
 4. Electrical Equipment/Work Painting: Coordinate painting requirements with the Electrical Contractor. Finish paint as required, all exposed to view exterior Electrical equipment and/or Work not subsequently covered with other finish materials.
 5. Intention: Except as otherwise specified herein, the following Specifications cover all selective Work throughout the Project exterior of the building(s), usually painted or finished to make a complete job. When an item is not mentioned, paint or finish to match Work in similar locations or as directed.
- B. Color Selections: Refer to the Drawings.
- C. Door and Frame Schedule: Refer to the Drawings.
- D. Related Sections: The following items of related Work will be provided under other sections of the Specifications:
1. Cast-In-Place Concrete - 03 30 00.
 2. Shop Prime Painting:
 - a. Miscellaneous Metal Work - Section 05 50 00.
 - b. Hollow Metal Doors and Pressed Steel Door Frames - Section 08 11 13.

3. Pre-Finished Items: Unless otherwise indicated, do not paint when factory-finishing or installer-finishing is specified.
 - a. Prefinished Metal Gutters, Downspouts and Brackets - Section 07 60 00.
 - b. Overhead Coiling Doors - Section 08 33 23.
 - c. Prefinished Hardware - Section 08 70 00.
 - d. Prefinished Metal Siding - Section 13 34 19.
 - e. Prefinished Metal Roofing - Section 13 34 19.

1.02 QUALITY ASSURANCE

- A. Environmental Requirements: Products shall comply with all applicable Federal and State Regulations on Volatile Organic Compounds (VOC).
- B. OSHA Compliance: Painting of physical hazards, protective, fire fighting, and safety equipment shall comply with the Occupational Safety and Health (OSH) Act. Colors shall comply with American National Standards Institute (ANSI), American Standard for Safety Colors - ANSI Z535.1 (formerly ANSI Z53.1).
- C. Preparations: Galvanized metal SSPC surface preparation method designations as specified herein shall be in accordance with The Society for Protective Coatings (SSPC), 40 24th Street, 6th Floor, Pittsburgh, PA 15222, (412)281-2331 or (877)281-7772; www.sspc.org.
- D. Material Shelf Life: Do not retain material at the jobsite which has exceeded the shelf life recommended by the manufacturer.

1.03 SUBMITTALS

- A. General: Submit Product Data and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Colors, Samples, and Manufacturer's Literature: Immediately after award of the Contract, submit to the Architect and the Owner, Samples of Work showing colors, requests for approval, and copies of manufacturer's specifications for all materials to be used, including the following:
 1. Paint Schedule, listing type of paint, and locations to be used.
 2. Preparation of surfaces to be painted or finished.
 3. Methods of application.
 4. Materials for thinning, and recommended thinning rates.
 5. Recommended temperatures for application.
 6. Time intervals between coats.
 7. Spreading rates, and dry film thickness obtained over various surfaces at the recommended spreading rates.
 8. Recommended equipment for application.

1.04 PRODUCT DELIVERY, HANDLING AND STORAGE

- A. General: All materials shall be delivered to site in manufacturer's sealed containers. Each container shall be labeled by the manufacturer; labels shall give manufacturer's name, brand, type of material, color of material, and instructions for reducing. Thinning shall be done only in accordance with directions of manufacturer.
- B. Storage Area: A protected area on the premises shall be assigned for the storage of painting tools and materials. Paint material storage area shall be a well-ventilated area at a minimum ambient temperature of 45° F and maximum of 90° F. Protect floor areas with drop cloths or building paper. Contractor shall take all necessary precautionary measures to prevent fire hazards and provide suitable fire fighting equipment in each storage area. Place cloths and cotton waste in covered metal containers or destroy at the end of each workday.
- C. Rags and Waste Materials: All oily rags and waste shall be removed from the building(s) every night, and, under no circumstances, shall be allowed to accumulate. Every precaution shall be taken to avoid any danger of fire and the potential for spontaneous combustion.

1.05 PROTECTION

- A. General: Protect finish Work from damage. Remove paint materials from finished surfaces immediately. Pay the costs for remedial Work required to correct any damage. Provide protective coverings as required to protect finished surfaces, and post "Wet Paint" signs to protect newly painted surfaces. At completion of Project, touch-up all areas of marred, missing or damaged finish.
- B. Prefinished Materials: Properly protect floors, finished woodwork, glass, finish hardware, and other prefinished materials from damage due to paint and stain spots; and repair damage to items through neglect or carelessness from painters. Where it becomes necessary to remove temporary covering from any character of Work in order to execute Painting Work, replace the coverings in a proper manner. In case coverings cannot be replaced, protect the Work in a satisfactory manner.
- C. Spray Applications: Where application of paint, stain, or sealer is applied by spray equipment; provide protective coverings as required to protect the adjacent finished surfaces. Contractor shall pay the costs for remedial Work required to correct any damage caused.

1.06 PROJECT CONDITIONS

- A. Environmental Conditions: Apply materials during low humidity and temperature ranges suitable for the formation of good durable films. Do not apply paint or stain in rain, snow, fog, or mist, or when the relative humidity exceeds 85%. Apply paints, other than water thinned coatings, only to surfaces completely free of surface moisture.

1. Application of Products: Surfaces to be painted shall be dry. Do not apply paint to surfaces with visible moisture, water, ice, or frost. Do not apply paint when the temperature of the surfaces to be painted, and of the surrounding atmosphere is below 50°F. for water thinned coatings, and below 45°F. for other coatings, or when temperature is expected to drop to 32°F. During periods of inclement weather continue painting if the areas and surfaces are enclosed and heat is supplied, provided the specified temperature and humidity conditions are maintained. In case the paint manufacturer's specifications or instructions differ from the above specifications, apply the more stringent requirements to the Work.

1.07 PRE-PAINTING AND FINISHING CONFERENCE

- A. Job-Site Meeting: Before starting Work, arrange a job-site meeting with representatives of the General Contractor, Owner, Owner's Painting Consultant, and the Architect to discuss procedures, Specifications, colors, application, job and surface readiness, material storage and protection, and any questions pertaining to the Painting and Finishing Work.

1.08 SCAFFOLDING

- A. Provide, erect, and maintain all scaffolding, ladders, etc., all in accordance with the standards of all governing local, state, and national safety codes, as required for the performance of all Work of this section of the Specifications. Such equipment shall be erected at times and locations so as not to delay any part of this or any other Work. When no longer required, promptly dismantle the equipment and remove same from the site.

1.09 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance of the Work.

1.10 PAINT COLORS

- A. Color Schedules on the Drawings: Before any Work is done, refer to the Drawings for color selection notes indicating the locations of various colors. Contractor shall prepare two (2) 8" x 10" Samples of each color required until colors, sheens, and textures are satisfactory to the Architect, Owner, and Tenant.
- B. Color References: Selected manufacturer's colors specified herein and/or noted on the Drawings are for "color reference only" and do not necessarily reflect the final approved manufacturer's product.
- C. Exterior Colors: Provide the following paint colors as specified herein for surfaces indicated on the Drawings to be field painted and/or finished. Refer to the Drawings for all other colors required.
 1. Concrete Ramps: Benjamin Moore, "Safety Yellow", unless otherwise noted on the Drawings.
 2. Guard Posts: Unless otherwise indicated on the Drawings, color shall match Benjamin Moore, "Safety Yellow" for guard posts.
 3. Natural Gas Piping on Roof: Pipes on walls shall match wall color.
- D. Colors or Finishes Not Noted or Specified:
 1. Exterior colors shall be selected by the Architect and/or Owner.

1.11 MAINTENANCE MATERIALS

- A. Extra Materials: Not less than thirty (30) days prior to completion of the facility, deliver to the Owner's Representative the following materials for Owner's future use. Materials shall be delivered together with a list of manufacturer's names, product designations, addresses, and phone numbers. Materials shall be boxed, sealed, and clearly identified as to product and specific location of use. Furnish the following quantities of material for use within the designated area.
 - 1. Finish Schedule shall indicate manufacturer's name, product, code number, mix formula for each type and color used.
 - 2. One (1) gallon of each color used. Container shall contain manufacturer's name, product name or code number, and mix formula.
- B. Extra Material Not Required: Scheduled products such as field applied PVDF/Kynar®, Fluorocarbon, and/or Fluoropolymer Coatings.

PART 2 -PRODUCTS

2.01 MATERIALS

- A. Manufacturers and Paint Types:
 - 1. Manufacturers for Scheduled Paint Systems:
 - a. (BM): Benjamin Moore® & Co., Montvale, NJ, (800)344-0400, (201)573-9600 or (888)236-6667; www.benjaminmoore.com.
 - b. (S-W): The Sherwin-Williams® Company, Cleveland, OH, (800)321-8194; www.sherwin-williams.com.
- B. Material Compatibility: Paint products for application on shop prime coated items shall be compatible with the paint types applied in the shop. Provide barrier coats over incompatible primers or remove and reprime. Notify Architect in writing of any anticipated problems using coating systems as specified with substrates primed by others.
- C. Paint Grade: Provide "lead and zinc chromate free", commercial grade coatings regularly manufactured by the approved paint materials manufacturers specified herein. Materials not displaying manufacturer's identification as a standard commercial-grade product, will not be acceptable. "Professional" or "Economy" product lines are not acceptable.
- D. Manufacturers and Products: Bids shall be based on the use of the specific brands and quality as specified herein. If Contractor desires to use materials of a manufacturer other than specified herein, the Contractor shall make the request in writing to the Architect, giving the name of the manufacturer and the specific name of each product offered as a substitute, and state the amount to be added to or deducted from the bid for substitution.
- E. Claims: No claim as to the unsuitability of any materials specified, or to produce first class Work will be accepted, unless claim is made in writing at the time of submitting Proposal.

2.02 MATERIAL PREPARATION

- A. General: Prepare all materials in strict accordance with the manufacturer's written directions. Thin, when required, with materials recommended by the paint manufacturer, using amounts not exceeding the paint manufacturer's recommendations. Keep materials stirred to a uniform density during

application. Remove films that may form in containers by straining if necessary. Keep materials not in use in covered containers. Use clean containers.

- B. Mixing/Tinting: Job mixing, or job tinting may be done when approved by the Architect.

PART 3 -EXECUTION

3.01 INSPECTION

- A. Defective Surfaces: Examine all surfaces to be painted or stained and report any unacceptable surfaces to the General Contractor in writing, for correction. If any defective surfaces are painted or stained, the refinishing of defective surfaces shall be done at Painting Contractor's expense. Starting Work will be construed as Painting Contractor's acceptance of the surface.
- B. Detrimental Conditions: Do not paint or stain over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film or stain finish.
- C. Satisfactory Conditions: Do not proceed with Work until satisfactory conditions have been corrected in a manner acceptable to the Owner's Representative.

3.02 PREPARATIONS

- A. General Procedures: Before painting or staining, remove hardware, accessories, plates, lighting fixtures, and similar items to provide ample protection. When necessary; disconnect items such as fixtures to permit painting; reinstall and reconnect upon completion. Remove doors if necessary to paint bottom edge. Upon completion of each space or area, reinstall removed items upon completion of painting and finishing Work. Use only skilled mechanics for removing and connecting above items.
- B. Cleaning: All surfaces shall be cleaned before applying surface treatments or paint. Remove oil and grease prior to cleaning. Schedule cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces. Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry completely.
- C. Signs on Glass: Where/if painted signs or numerals are to be applied on glass doors, thoroughly clean with soap and water prior to painting.
- D. Protection: Properly protect sidewalks, floors, finished woodwork, glass, finish hardware, and other prefinished materials from damage due to paint or stain spots; and repair damage to items through neglect or carelessness from painters or from failure to properly protect. Where it becomes necessary to remove temporary covering from any character of Work in order to execute Painting Work, replace the coverings in a proper manner. In case coverings cannot be replaced, protect the Work in a satisfactory manner.
- E. Condition of Surfaces: Surfaces shall be perfectly clean, smooth and dry.
- F. Material Mixing: Thoroughly stir or agitate all materials until the ingredients are completely intermixed.
- G. Concrete: Surfaces, required to be painted and/or stained shall be dry and clean before application of specified products. Concrete to be cured as recommended by manufacturer; approximately 30 days. Remove all form release and curing agents.
- H. Steel and Iron: Remove grease, rust scale, and dust and touch-up any chipped or abraded places on items that have been shop coated. Where steel and iron have a heavy coating of scale, remove same by wire brushing or sandblasting as necessary to produce a satisfactory surface for painting.

- I. Galvanized Metal: Solvent clean galvanized surfaces with non-petroleum based solvents in accordance with SSPC-SP 1, Solvent Cleaning, then prime as required. Mechanically remove pretreatment or rust without damaging or removing the galvanizing. Allow the coating to dry at least one (1) week. If adhesion is poor, brush-off blast cleaning in accordance with SSPC-SP 7 is necessary to remove these treatments.
- J. Finish Hardware for Doors: Items specified for field painting and not having a BHMA Finish Code 600 shall be cleaned, etched, and prepped in accordance with finish hardware manufacturer's recommendations. Prevent paint from entering and filling operating parts of finish hardware.
- K. Gypsum Wallboard: Spackle and sand flush all imperfections, cracks and gouges prior to finishing. Joints shall be taped and finished by Gypsum Wallboard Contractor. Do not begin paint application until finishing compound is dry and sanded smooth.
- L. Paint Removal Work: Remove all paint from finish hardware, sidewalk, floor areas, glass, and metal Work not required to be painted.
- M. Touch-Up Work: Perform all necessary touching-up after other trades have completed Work and leave the entire Work in a neat and clean condition to the satisfaction of the Owner and the Architect.

3.03 APPLICATION

- A. General Requirements: Except as otherwise specified herein, prepare all surfaces and apply all materials in accordance with the manufacturer's written specifications, as submitted to, and reviewed by the Architect.
 - 1. All materials shall be evenly applied by skilled tradesmen completely covering surfaces to provide an opaque, smooth, uniform finish and color, free of spotting, holidays, laps, brush marks, runs, sags, crawls or other imperfections.
 - 2. All painted surfaces shall be uniform in finish and color, shade, and texture.
 - 3. Each coat shall provide a uniform film, free from runs, skips, laps, streaks, or marks.
 - 4. Tint all coats to the color of the finish coat, but in different lighter shades.
 - 5. All glass lines, where required, shall be neatly drawn.
 - 6. Spreading rate shall not exceed that recommended by manufacturer for surface being covered.
 - 7. Primer-sealer coats shall be repainted as required to eliminate suction spots. Touch-up prime coats to provide a continuous primed surface.
 - 8. Allow each coat to dry prior to application of succeeding coats.
 - 9. Paint edges of doors in with surfaces.
 - 10. Seal pitch streaks and knots in wood that is to have a painted finish with shellac after first coat.
 - 11. Spray, Roller and Brush Painting:
 - a. Finishes such as gypsum wallboard, plywood or plaster, shall be brush or roller painted.
 - b. Trim, doors, and all other similar surfaces shall be brush painted.
 - c. Spray or roller painting must be equivalent to high quality brush Work.

12. All areas and surfaces to be painted and/or stained shall be released for same by the Architect.

B. Performance and Finish Requirements: According to the specified paint manufacturers, the type of finish and number of coats specified are adequate to provide color, coverage, waterproofing and weather resistance when properly applied. If, after the specified number of coats are applied, adequate color, coverage, waterproofing and weather resistance have not been achieved, it shall be Painting Contractor's responsibility to apply additional coats, at no extra cost to the Owner, until acceptable performance and finish is obtained.

1. The use of thinner shall be carefully restricted and used only as recommended by the paint manufacturer.

2. Paint and stain material manufacturer's recommended spreading rate, and wet or dry mil thickness shall be rigidly adhered to.

C. Exterior Door Edges: Unless otherwise indicated on the Drawings, paint tops, bottoms, and edges of exterior hollow metal doors with same paint product as exterior faces.

3.04 SURFACES NOT TO BE PAINTED

A. The following surfaces shall not be painted:

1. Concrete surfaces, except where specifically shown and noted on the Drawings and/or specified.
2. Surfaces, including exposed pipe, conduit, and ductwork, concealed from view by suspended finish ceiling or soffit, or covered with other finish materials.
3. All items specified to be factory finished.
4. Aluminum Work (unless otherwise indicated on the Drawings and/or specified), stainless steel, copper, bronze, and brass.
5. Code required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

3.05 PAINTING SCHEDULE

A. Exterior - Metal:

1. General Requirements: If ferrous metal or galvanized ferrous metal surfaces are found damaged or not primed by the supplier of same, apply one (1) coat of priming paint to ferrous metal, and prepare (wash and etch) and apply coating of priming paint to galvanized ferrous metal, using material types specified herein. In general, prime coats specified herein will not be required on items delivered with prime or shop coats already applied. (Refer to other sections of the Specifications.) Finish with two (2) coats of exterior paint specified for metal.
2. Ferrous Metal: Surfaces to be painted shall include, but not be limited to the following:
 - a. Exposed Structural Steel as indicated on Drawings.
 - b. Steel Guard Posts.
 - c. Steel Pipe Hand Railings and Posts.
 - d. Miscellaneous Metal Items such as Steel Jambs, Edgings, Steel Channels at dock levelers.
 - e. Exposed Gas Piping as required by Drawings and/or field conditions.

- f. Exposed Electrical Conduit as required by Drawings and/or field conditions.
- 3. Galvanized Ferrous Metals: Surfaces to be painted shall include, but not be limited to the following:
 - a. Exposed Steel Lintels.
 - b. Steel Pressure Bars as indicated on the Drawings.
 - c. Metal Flashings, as indicated on the Drawings.
 - d. Ladders.
 - e. Hollow Metal Doors and Pressed Steel Frames, including all edges of doors, unless otherwise specified.
- 4. Paint System for Ferrous Metals: Exposed surfaces, unless otherwise noted, shall receive the following system, or comparable manufacturer as specified herein with equivalent products subject to review by the Architect.
 - a. One (1) Prime Coat: (S-W) Kem Kromik Metal Primer, (B50Z Series) at 3 - 4 mils DFT.
 - b. Two (2) Finish Coats: (S-W) Duration Exterior Latex Satin Coating (K33 Series) at 2.5 - 3 mils DFT per coat.
- 5. Paint System for Galvanized Ferrous Metals: Exposed surfaces, unless otherwise noted, shall receive the following system, or other comparable manufacturer as specified herein with equivalent products subject to review by the Architect.
 - a. One (1) Prime Coat: (S-W) DTM Acrylic Primer/Finish, B66W1 at 2.5 - 5 mils per DFT.
 - b. Two (2) Finish Coats: (S-W) Duration Exterior Latex Satin Coating (K33 Series), at 2.5 - 3 mils DFT per coat.
- 6. Paint System for Aluminum: Exposed surfaces, unless otherwise noted, shall receive the following system.
 - a. Two (2) Prime/Finish Coats: (SW) Duration Exterior Latex Satin Coating (K33 Series) at 2.5 - 3 mils DFT per coat.
- B. Exterior - Concrete (Cast In-Place Concrete):
 - 1. Paint System: Exposed concrete surfaces as indicated on the Drawings to be painted, shall receive the following system, or other comparable manufacturer as specified herein with equivalent products subject to review by the Architect.
 - a. One (1) Prime Coat: (S-W) Loxon® Conditioner, A24W-01100.
 - b. Two (2) Finish Coats: (S-W) A-100® Exterior Latex Flat, A6-100 Series.
- C. Exterior - Concrete Retaining Walls:
 - 1. Paint System: Exposed concrete walls indicated on the Drawings shall receive the following system, or comparable manufacturer as specified herein with equivalent products subject to review by the Architect.
 - a. One (1) Prime Coat: (S-W) Kem Cati-Coat® HS Epoxy Filler/Sealer, B42 Series.

- b. One (1) Finish Coat: (S-W) A-100® Exterior Latex Flat, A6-100 Series.

3.06 CLEAN-UP

- A. Damaged Finished Surfaces: At own expense, thoroughly clean, or replace, if required by extensive damage, all adjacent finished surfaces soiled during the Work of this section.
- B. Debris, Waste, and Unused Materials: During progress of the Work, keep the premises free of all debris and waste materials resulting from the Work of this section. Remove all debris and rubbish from the site and dispose of legally. Until removal, store rags and waste in metal containers with metal covers. Upon completion of Work and before final acceptance of the Work, remove all debris, rubbish, unused materials, tools, and equipment from the site.

END OF SECTION

SECTION 09 91 23INTERIOR PAINTING AND FINISHING

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, tools and equipment, protection, and services necessary for Painting and Finishing Work on new and existing construction as indicated on the Drawings and specified herein. Work includes, but is not limited to the following:
1. General: Preparation of surfaces for painting and finishing.
 2. Interior Surfaces: Application of paint or special coating for the following exposed to view surfaces:
 - a. Ferrous Metal Work.
 - b. Galvanized Metal Work, where required by Drawings and/or field conditions.
 - c. Hollow Metal Doors and Pressed Steel Door Frames.
 - d. Structural Steel, including Steel Columns, Beams, and Steel Joists as indicated on the Drawings.
 - e. Gypsum Wallboard.
 - f. Exposed Steel/Metal Construction, as indicated on the Drawings.
 3. Mechanical Work Painting: Finish paint as indicated, exposed to view interior Mechanical equipment and/or Work not subsequently covered with other finish materials, except for piping identification. Coordinate painting requirements with the Mechanical Contractor.
 4. Electrical Work Painting: Finish paint as indicated, exposed to view interior Electrical equipment and/or Work not subsequently covered with other finish materials. Coordinate painting requirements with the Electrical Contractor.
 5. Intention: Except as otherwise specified herein, the following Specifications cover selective Work throughout the Project select interior items of the building(s), usually painted or finished to make a complete job. When an item is not mentioned, paint or finish to match Work in similar locations or as directed.
- B. Color Selections: Refer to the Drawings.
- C. Door and Frame Schedule: Refer to the Drawings.
- D. Related Sections: The following items of related Work will be provided under other sections of the Specifications:
1. Gypsum Wallboard Construction - Section 09 29 00.

2. Shop Prime Painting:
 - a. Miscellaneous Metal Work - Section 05 50 00.
 - b. Hollow Metal Doors and Pressed Steel Door Frames - Section 08 11 13.
3. Pre-Finished Items: Unless otherwise indicated, do not paint when factory-finishing or installer-finishing is specified.
 - a. Overhead Coiling Doors - Section 08 33 23.
 - b. Prefinished Hardware - Section 08 70 00.

1.02 QUALITY ASSURANCE

- A. Environmental Requirements: Products shall comply with all applicable Federal and State Regulations on Volatile Organic Compounds (VOC).
- B. OSHA Compliance: Painting of physical hazards, protective, fire fighting, and safety equipment shall comply with the Occupational Safety and Health (OSH) Act. Colors shall comply with American National Standards Institute (ANSI), American Standard for Safety Colors – ANSI Z535.1 (formerly ANSI Z53.1).
- C. Preparations: Aluminum and galvanized metal SSPC surface preparation method designations as specified herein shall be in accordance with The Society for Protective Coatings, (SSPC), 40 24th Street, 6th Floor, Pittsburgh, PA 15222, (412)281-2331 or (877)281-7772; www.sspc.org.
- D. Material Shelf Life: Do not retain material at the jobsite which has exceeded the shelf life recommended by the manufacturer.
- E. Paint Compatibility: Painting Contractor shall furnish paint Samples designated for painting of sprayed-on fireproofing to the approved fireproofing manufacturer to verify compatibility and adhesion quality.

1.03 SUBMITTALS

- A. General: Submit Product Data and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Colors, Samples, and Manufacturer's Literature: Immediately after award of the Contract, submit to the Architect and the Owner, Samples of Work showing colors, requests for approval, and copies of manufacturer's specifications for all materials to be used, including the following:
 1. Paint Schedule, listing type of paint and locations to be used.
 2. Preparation of surfaces to be painted, stained or finished.
 3. Methods of application.
 4. Materials for thinning, and recommended thinning rates.
 5. Recommended temperatures for application.
 6. Time intervals between coats.
 7. Spreading rates, and dry film thickness obtained over various surfaces at the recommended spreading rates.

8. Recommended equipment for application.

1.04 PRODUCT DELIVERY, HANDLING AND STORAGE

- A. General: All materials shall be delivered to site in manufacturer's sealed containers. Each container shall be labeled by the manufacturer; labels shall give manufacturer's name, brand, type of material, color of material, and instructions for reducing. Thinning shall be done only in accordance with directions of manufacturer.
- B. Storage Area: A protected area on the premises shall be assigned for the storage of painting tools and materials. Paint material storage area shall be a well-ventilated area at a minimum ambient temperature of 45° F and maximum of 90° F. Protect floor areas with drop cloths or building paper. Contractor shall take all necessary precautionary measures to prevent fire hazards and provide suitable fire fighting equipment in each storage area. Place cloths and cotton waste in covered metal containers or destroy at the end of each workday.
- C. Rags and Waste Materials: All oily rags and waste shall be removed from the building(s) every night, and, under no circumstances, shall be allowed to accumulate. Every precaution shall be taken to avoid any danger of fire and the potential for spontaneous combustion.

1.05 PROTECTION

- A. General: Protect finish Work from damage. Remove paint materials from finished surfaces immediately. Pay the costs for remedial Work required to correct any damage. Provide protective coverings as required to protect finished surfaces, and post "Wet Paint" signs to protect newly painted surfaces. At completion of Project, touch-up all areas of marred, missing or damaged finish.
- B. Prefinished Materials: Properly protect floors, finished woodwork, glass, finish hardware, and other prefinished materials from damage due to paint spots; and repair damage to items through neglect or carelessness from painters. Where it becomes necessary to remove temporary covering from any character of Work in order to execute Painting Work, replace the coverings in a proper manner. In case coverings cannot be replaced, protect the Work in a satisfactory manner.
- C. Spray Applications: Where application of paint, stain, or sealer is applied by spray equipment; provide protective coverings as required to protect the adjacent finished surfaces. Contractor shall pay the costs for remedial Work required to correct any damage caused.

1.06 PROJECT CONDITIONS

- A. Environmental Conditions: Apply materials during low humidity and temperature ranges suitable for the formation of good durable films. Do not apply paint or stain when the relative humidity exceeds 85%. Apply paints, other than water thinned coatings, only to surfaces completely free of surface moisture.
 - 1. Application of Products: Surfaces to be painted shall be dry. Do not apply paint to surfaces with visible moisture. Do not apply paint when the temperature of the surfaces to be painted, and of the surrounding atmosphere is below 50°F. for water thinned coatings, and below 45°F. for other coatings. In case the paint manufacturer's specifications or instructions differ from the above specifications, apply the more stringent requirements to the Work.
- B. Coordination of Work: Examine Mechanical and Electrical Work in areas to receive painting and finishing Work. Verify with Mechanical and Electrical Contractors that all of their construction operations and installations are complete, and that the scheduled areas are ready to receive painting and finishing Work. All exposed Work, including HVAC ductwork, diffusers and returns, piping, conduits, and lighting supports shall be installed prior to commencing painting and finishing Work.

1.07 PRE-PAINTING AND FINISHING CONFERENCE

- A. Job-Site Meeting: Before starting Work, arrange a job-site meeting with representatives of the General Contractor, Owner, Owner's Painting Consultant, and the Architect to discuss procedures, Specifications, colors, application, job and surface readiness, material storage and protection, and any questions pertaining to the Painting and Finishing Work.

1.08 SCAFFOLDING

- A. Provide, erect, and maintain all scaffolding and ladders in accordance with the standards of governing local, state, and national safety codes. Erect equipment at times and locations so as not to delay any part of Work. When no longer required, promptly dismantle equipment and remove from the site.

1.09 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance of the Work.

1.10 PAINT COLORS

- A. Color Schedules on Drawings: Before any Work is done, refer to the Drawings for color selection notes, indicating the locations of various colors. Contractor shall prepare two (2) 8" x 10" Samples of each color required until colors, sheens, and textures are satisfactory to the Architect, Owner, and Tenant.
- B. Color References: Selected manufacturer's colors specified herein and/or noted on the Drawings are for "color reference only" and do not necessarily reflect the final approved manufacturer's product.
- C. Interior Colors: Provide the following paint colors as specified herein for surfaces indicated on the Drawings to be field painted and/or finished. Refer to the Drawings for all other colors required.
1. Floor Striping: Unless otherwise noted on the Drawings, color shall match Benjamin Moore®, "Safety Yellow".
 2. Guard Posts: Unless otherwise indicated on the Drawings, color shall match Benjamin Moore "Safety Yellow".
- D. Colors or Finishes Not Noted or Specified: Interior colors shall be as approved or selected by the Architect and/or Owner.

1.11 MAINTENANCE MATERIALS

- A. Extra Materials: Not less than thirty (30) days prior to opening of the facility, deliver to the Owner's Representative the following materials for Owner's future use. Materials shall be delivered together with a list of manufacturer's names, product designations, addresses, and phone numbers. Materials shall be boxed, sealed, and clearly identified as to product and specific location of use. Furnish the following quantities of material for use within the designated area.
1. Finish Schedule shall indicate manufacturer's name, product, code number, mix formula for each type and color used.
 2. One (1) gallon of each color used. Container shall contain manufacturer's name, product name or code number, and mix formula.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Manufacturers and Paint Types:

1. Manufacturers for Scheduled Paint Systems:

- a. (BM): Benjamin Moore® & Co., Montvale, NJ, (800)344-0400, (201)573-9600 or (888)236-6667; www.benjaminmoore.com.
- b. (S-W): The Sherwin-Williams® Company, Cleveland, OH, (800)321-8194; www.sherwin-williams.com.

2. Material Compatibility: Paint products for application on shop prime coated items shall be compatible with the paint types applied in the shop.

B. Paint Grade: Provide “lead and zinc chromate free”, commercial grade coatings regularly manufactured by the approved paint materials manufacturers specified herein. Materials not displaying manufacturer’s identification as a standard commercial-grade product, will not be acceptable. “Professional” or “Economy” product lines are not acceptable.

C. Manufacturers and Products: Bids shall be based on the use of the specific brands and quality as specified herein. If Contractor desires to use materials of a manufacturer other than specified herein, the Contractor shall make the request in writing to the Architect, giving the name of the manufacturer and the specific name of each product offered as a substitute, and state the amount to be added to or deducted from the bid for substitution.

D. Claims: No claim as to the unsuitability of any materials specified, or to produce first class Work will be accepted, unless claim is made in writing at the time of submitting Proposal.

2.02 MATERIAL PREPARATION

A. General: Prepare all materials in strict accordance with the manufacturer’s written directions. Thin, when required, with materials recommended by the paint manufacturer, using amounts not exceeding the paint manufacturer’s recommendations. Keep materials stirred to a uniform density during application. Remove films that may form in containers by straining if necessary. Keep materials not in use in covered containers. Use clean containers.

B. Mixing/Tinting: Job mixing, or job tinting may be done when approved by the Architect.

2.03 EXISTING METAL SURFACE PRETREATMENT

A. Remove all loose paint by providing mechanical cleaning methods, such as wire brushing and scraping as recommended by the paint manufacturer.

B. Thoroughly clean all previously painted or factory finished existing metal surfaces noted on the Drawings to be painted.

C. After cleaning, provide cold phosphatizing of the existing metal surfaces with a field applied “wash primer”, or other comparable method recommended by the paint manufacturer to provide an effective treatment for promoting coating adhesion to the metal surfaces.

D. Comparable treatments shall be subject to review by the Architect.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Defective Surfaces: Examine all surfaces to be painted or stained and report any unacceptable surfaces to the General Contractor in writing, for correction. If any defective surfaces are painted or stained, the refinishing of defective surfaces shall be done at Painting Contractor's expense. Starting Work will be construed as Painting Contractor's acceptance of the surface.
- B. Detrimental Conditions: Do not paint or stain over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film or stain finish.
- C. Satisfactory Conditions: Do not proceed with Work until satisfactory conditions have been corrected in a manner acceptable to the Owner's Representative.

3.02 PREPARATIONS

- A. General Procedures: Before painting remove as required by field conditions, hardware, accessories, plates, lighting fixtures, and similar items to provide ample protection. When necessary; disconnect items such as fixtures to permit painting; reinstall and reconnect upon completion. Remove doors if necessary to paint bottom edge. Upon completion of each space or area, reinstall removed items upon completion of painting and finishing Work. Use only skilled mechanics for removing and connecting above items.
- B. Cleaning: All surfaces shall be cleaned before applying surface treatments or paint. Remove oil and grease prior to cleaning. Schedule cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces. Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry completely.
- C. Signs on Glass: Where/if painted signs or numerals are to be applied on glass doors, thoroughly clean with soap and water prior to painting.
- D. Protection: Properly protect floors, finished woodwork, glass, finish hardware, and other prefinished materials from damage due to paint or stain spots; and repair damage to items through neglect or carelessness from painters or from failure to properly protect. Where it becomes necessary to remove temporary covering from any character of Work in order to execute Painting Work, replace the coverings in a proper manner. In case coverings cannot be replaced, protect the Work in a satisfactory manner.
- E. Condition of Surfaces: Surfaces shall be perfectly clean, smooth and dry.
- F. Material Mixing: Thoroughly stir or agitate all materials until the ingredients are completely intermixed.
- G. Inaccessible Surfaces: Before installation, thoroughly back-paint all woodwork, unless otherwise noted, with one (1) coat of an approved oil paint on all surfaces which will be inaccessible after installation. Coordinate Work with Carpentry Contractor.
- H. Concrete: Surfaces required to be painted shall be dry and clean before application of specified products.
- I. Steel and Iron: Remove grease, rust scale, and dust and touch-up any chipped or abraded places on items that have been shop coated. Where steel and iron have a heavy coating of scale, remove same by wire brushing or sandblasting as necessary to produce a satisfactory surface for painting.

- J. Galvanized Metal: Solvent clean galvanized surfaces with non-petroleum based solvents in accordance with SSPC-SP 1, Solvent Cleaning, then prime as required. Mechanically remove pretreatment or rust without damaging or removing the galvanizing. Allow the coating to dry at least one (1) week. If adhesion is poor, brush-off blast cleaning in accordance with SSPC-SP 7 is necessary to remove these treatments.
- K. Finish Hardware for Doors: Items specified for field painting and not having a BHMA Finish Code 600 shall be cleaned, etched, and prepped in accordance with finish hardware manufacturer's recommendations. Prevent paint from entering and filling operating parts of finish hardware.
- L. Gypsum Wallboard: Spackle and sand flush all imperfections, cracks and gouges prior to finishing. Joints shall be taped and finished by Gypsum Wallboard Contractor. Do not begin paint application until finishing compound is dry and sanded smooth.
- M. Sprinkler Heads: Areas equipped with sprinkler heads shall be provided with adequate protection from painting operations.
- N. Paint Removal Work: Remove all paint from finish hardware, floor areas, glass, and metal Work not required to be painted.
- O. Touch-Up Work: Perform all necessary touching-up after other trades have completed Work and leave the entire Work in a neat and clean condition to the satisfaction of the Owner and Architect.

3.03 APPLICATION

- A. General Requirements: Except as otherwise specified herein, prepare all surfaces and apply all materials in accordance with the manufacturer's written specifications, as submitted to, and reviewed by the Architect.
 - 1. All materials shall be evenly applied by skilled tradesmen completely covering surfaces to provide an opaque, smooth, uniform finish and color, free of spotting, holidays, laps, brush marks, runs, sags, crawls or other imperfections.
 - 2. All painted surfaces shall be uniform in finish and color, shade, and texture.
 - 3. Each coat shall provide a uniform film, free from runs, skips, laps, streaks, or marks.
 - 4. Tint all coats to the color of the finish coat, but in different lighter shades.
 - 5. All glass lines shall be neatly drawn.
 - 6. Spreading rate shall not exceed that recommended by manufacturer for surface being covered.
 - 7. Primer-sealer coats shall be repainted as required to eliminate suction spots. Touch-up prime coats to provide a continuous primed surface.
 - 8. Allow each coat to dry prior to application of succeeding coats.
 - 9. Paint edges of doors in with surfaces.
 - 10. Spray, Roller and Brush Painting:
 - a. Spray and roller painting on interior masonry, where required, will be permitted.
 - b. Interior ceiling and wall finishes such as gypsum wallboard, plywood or plaster, shall be brush or roller painted.

- c. Trim, doors, and all other similar surfaces shall be brush painted.
- d. Spray or roller painting must be equivalent to high quality brush Work.

11. All areas and surfaces to be painted and/or stained shall be released for same by the Architect.

B. Performance and Finish Requirements: According to the specified paint manufacturers, the type of finish and number of coats specified are adequate to provide color and coverage when properly applied. If, after the specified number of coats are applied, adequate color and coverage have not been achieved, it shall be Painting Contractor's responsibility to apply additional coats, at no extra cost to the Owner, until acceptable performance and finish is obtained.

- 1. The use of thinner shall be carefully restricted and used only as recommended by the paint manufacturer.
- 2. Paint and stain material manufacturer's recommended spreading rate, and wet or dry mil thickness shall be rigidly adhered to.

C. Surfaces at Equipment and Furniture: Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only, before equipment is installed.

3.04 SURFACES NOT TO BE PAINTED

A. The following surfaces shall not be painted:

- 1. Concrete surfaces, except where specifically shown and noted on the Drawings and/or specified.
- 2. Surfaces, including exposed pipe, conduit, and ductwork, concealed from view by suspended finish ceiling or soffit, or covered with other finish materials.
- 3. All items specified to be factory finished.
- 4. Aluminum Work (unless otherwise indicated on the Drawings and/or specified), stainless steel, copper, bronze, and brass.
- 5. Code required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

3.05 PAINTING SCHEDULE

A. Interior - Exposed Steel and Metal Construction:

- 1. General: Exposed construction surfaces not subsequently concealed from view by suspended finish ceiling, soffit, or covered with other finish material, shall be painted. Items shall include, but not be limited to the following:
 - a. Structural steel, including steel columns, beams, and steel joists.
 - b. Steel plates at concrete columns.
 - c. Miscellaneous exposed steel plates.
 - d. Steel ladders.

- e. Mechanical equipment (including piping, ductwork, diffusers and returns, rain conductors, etc.).
 - f. Electrical equipment (including conduits, lighting supports, etc.).
2. General Paint System for Ferrous Metals: Exposed surfaces, unless otherwise noted, shall receive the following system, or other comparable manufacturer as specified herein with equivalent products subject to review by the Architect.
- a. One (1) Prime Coat: (S-W) DTM Acrylic Primer/Finish, B66W1. (Prime coat is not required on items delivered shop primed.)
 - b. Two (2) Finish Coats: (S-W) Metalatex® Semi-Gloss Coating, B42 Series.
3. General Paint System for Galvanized Ferrous Metals: Exposed surfaces, unless otherwise noted, shall receive the following system, or other comparable manufacturer as specified herein with equivalent products subject to review by the Architect.
- a. One (1) Prime Coat: (S-W) Pro-Cryl® Universal Primer B66-310 Series.
 - b. Two (2) Finish Coats: (S-W) Solo™ 100% Acrylic Interior/Exterior Semi-Gloss, A76 Series.
4. Interior Flat Finish Systems for Exposed Steel and Metal Construction:
- a. Paint System for Ferrous Metals: Exposed surfaces, shall receive the following flat finish system.
 - 1) One (1) Prime Coat: (S-W) DTM Acrylic Primer/Finish B66W1.
 - 2) Two (2) Finish Coats: (S-W) DTM Acrylic Primer/Finish B66W1.
 - b. Paint System for Galvanized Ferrous Metals: Exposed surfaces, shall receive the following flat finish system.
 - 1) One (1) Prime Coat: (S-W) DTM Acrylic Primer/Finish B66W1.
 - 2) Two (2) Finish Coats: (S-W) DTM Acrylic Primer/Finish B66W1.
5. Paint System for Primed or Galvanized Exposed Metal Deck.
- a. Primer/Finish Coat: As selected by Owner's Representative.
- B. Interior - Hollow Metal Doors and Pressed Steel Door Frames:
1. Semi-Gloss Enamel Finish: Exposed surfaces of pre-primed hollow metal doors (including tops, bottoms and edges) and pressed steel frames, unless otherwise noted and/or specified, shall receive the following system, or other comparable manufacturer as specified herein with equivalent products subject to review by the Architect.
- a. One (1) Spot Prime Coat: (S-W) Kem Kromik Metal Primer (B50Z Series) at 3-4 mils DFT.
 - b. Two (2) Finish Coats: (S-W) ProMar 200 Alkyd Semi-Gloss Enamel (B34 Series) at 1.5-2 mils DFT per coat.

C. Interior - Gypsum Wallboard:

1. Finish: Exposed wall surfaces of gypsum wallboard, unless otherwise noted, shall receive the following system, or other comparable manufacturer as specified herein with equivalent products subject to review by the Architect.
 - a. One (1) Prime Coat: (S-W) PrepRite® Classic Latex Primer (B28W101) at 1.5-2 mils DFT.
 - a. Two (2) Finish Coats: As selected by Owner's Representative.

D. Interior - Masonry:

1. Interior Block Masonry Walls: Interior exposed masonry walls indicated on the Drawings to be painted shall receive the following system, or other comparable manufacturer as specified herein with equivalent products subject to review by the Owner. Applications shall be in strict accordance with manufacturer's recommendations.
 - a. Prime Coat: (BM) Moorcraft Super Spec Latex Vapor Barrier Primer Sealer (260).
 - b. Finish Coats: None, unless otherwise indicated.
2. Interior Block Masonry Walls (Epoxy Finish): Interior exposed masonry walls indicated on the Drawings to be painted shall receive the following finish system, or other comparable manufacturer as specified herein with equivalent products subject to review by the Architect. Applications shall be in strict accordance with manufacturer's recommendations.
 - a. One (1) Prime Coat: (S-W) Heavy Duty Block Filler, B42W46.
 - b. Two (2) Finish Coats: (S-W) Water Based Catalyzed Epoxy, Semi-Gloss Finish, B70/B60V25.

E. Interior - Wood:

1. Telephone Backboards: Provide the following coating system as manufactured by Flame Control® Coatings, LLC, 4120 Hyde Park Boulevard, Niagara Falls, NY 14305, (800)433-4747 or (716)282-1399; www.flamecontrol.com, in accordance with the manufacturer's recommendations.
 - a. One (1) Prime Coat: Flame Control® No. 3003 Acrylic Primer.
 - b. One (1) Finish Coat: Flame Control® No. 20-20A Flat Latex Intumescent Paint, applied at 155 sq. ft./U.S. gal.

F. Interior - Epoxy Finish on Concrete Floors:

3. Exposed floor surfaces indicated to be painted shall receive the following system, or comparable manufacturer as specified herein with equivalent products subject to review by the Architect.
 - a. One (1) Prime Coat: (S-W) Armorseal® 8100 Satin (reduced with one pint of water per gallon.
 - b. Two (2) Finish Coats: (S-W) Armorseal® 8100 Satin.

- c. Non-Skid Enhancer: Concrete surfaces shall receive the specified paint system with a small amount of clean sand mixed and applied in accordance with the paint manufacturer's recommendations and specifications, to provide "non-skid" characteristics.

G. Interior - Concrete Floor Areas (Safety Zone Marking Paint):

- 1. Exposed Concrete Floor Surfaces: Areas as indicated on the Drawings, shall receive 4" wide "floor striping" with straight line stripes and diagonal patterns, as shown. Floor surfaces shall receive the following specified paint system with a small amount of clean sand mixed and applied in accordance with the paint manufacturer's recommendations and specifications, to provide "non-skid" characteristics, and to provide uniform straight edges.
- 2. Paint System: One (1) coat (SW) HOTLINE® Fast Dry Latex Traffic Marking Paint, TM2153 (Lead Free Yellow) flat finish, or comparable manufacturer as specified herein with equivalent products subject to review by the Architect.

H. Stenciling Rated Walls

- 1. Both sides of corridor partitions, smokestop partitions, horizontal exit partitions, exit enclosures, and fire walls shall be effectively and permanently identified with stenciling in a manner acceptable to the authority having jurisdiction and the Owner's Representative. Such identification shall be above the ceiling and in concealed spaces. Suggested wording: "Fire Rated Wall - Protect All Openings". Letters shall be 3" to 4" high and the phase shall be stenciled 15'-0" o. c., the length of the partition.

3.06 CLEAN-UP

- A. Damaged Finished Surfaces: At own expense, thoroughly clean, or replace, if required by extensive damage, all adjacent finished surfaces soiled during the Work of this section.
- B. Debris, Waste, and Unused Materials: During progress of the Work, keep the premises free of all debris and waste materials resulting from the Work of this section. Remove all debris and rubbish from the site and dispose of legally. Until removal, store rags and waste in metal containers with metal covers. Upon completion of Work and before final acceptance of the Work, remove all debris, rubbish, unused materials, tools, and equipment from the site.

END OF SECTION

SECTION 10 14 00SIGNAGE

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, equipment, apparatus, tools, transportation, protection and services necessary for, and reasonably incidental to the proper execution and completion of all Signage Work, as indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Interior-Room Identification Signage.
 - 2. Exit Signs.
 - 3. Barrier Free Signs.
- B. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:
 - 1. Gypsum Wallboard Construction - Section 09 29 00.
 - 2. Painting - Sections 09 91 23.
 - 3. Toilet Partitions - Section 10 21 13.

1.02 REFERENCE SPECIFICATIONS, CODES, AND APPLICABLE STANDARDS

- A. Requirements of Regulatory Agencies: Furnish all signs in accordance with the laws, codes, ordinances and regulations of the public authorities having jurisdiction, including Title III of The Americans With Disabilities Act (ADA), Public Law 101-336.

1.03 QUALITY ASSURANCE

- A. General: All materials, articles, accessories incorporated in the Work shall be type and quality specified herein, and subject to the Architect’s review. Methods of preparation, construction and installation of such materials, articles and accessories shall be strictly in accordance with the accepted standard practices, manufacturer’s printed specifications and/or instructions, the Architect’s Drawings and Specifications, and as directed by the Architect.
- B. Single Source Responsibility: For each separate type of sign required, obtain signs from one source from a single manufacturer.
- C. Design Criteria: The Drawings indicate size, profiles, dimensional requirements and graphics layout of signs and are based on the specific type and/or model indicated. Signs by other manufacturers may be considered provided that deviations in dimensions and profiles are minor and do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.

- D. Environmental Requirements: Paint products shall comply with all applicable Federal and State Regulations on Volatile Organic Compounds (VOC).

1.04 SUBMITTALS

- A. General: Submit Shop Drawings, Product Data, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Shop Drawings: Prepare and submit fully detailed drawings of all items specified herein.
- C. Product Data: Include manufacturer's construction details relative to materials, dimensions of individual components, profiles, and finishes for each type of sign required.
- D. Samples: Submit 4" x 4" color Samples on materials to be used for fabrication. Written approval shall be secured from the Architect. Installed materials shall match approved Samples.

1.05 MATERIAL DELIVERY AND STORAGE

- A. Delivery: Deliver only acceptable materials to the site in original boxes, and wrappings, clearly labeled with all pertinent information to facilitate checking.
- B. Storage: Materials shall be stored at the site off the ground and in properly protected dry storage facilities, until ready for use. Damaged materials will not be acceptable, and shall be removed from the site.

1.06 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

PART 2 - PRODUCTS

2.01 INTERIOR-ROOM IDENTIFICATION SIGNAGE

- A. Manufacturer: Signage specified herein shall be signs as manufactured by Best Sign Systems, Inc., 1202 N. Park Avenue, Montrose, CO 81401-3171, (970)249-2378 or (800)235-2378; www.bestsigns.com.
- B. Comparable Products: Comparable equivalent signage by the following manufacturer may be acceptable, subject to conformance with these Specifications and the Architect's review.
 - 1. ASI Sign Systems, Inc., 8181 Jetstar Drive, Suite 110, Irving, TX 75063, (972)915-3800 or (800)274-7732; www.asisignage.com.
- C. Sign Type: Signs shall be Best® Sign Systems - Graphic Blast MP Signs, suitable for doors and/or wall mounting.
 - 1. Construction: 1/8" thick, NEMA rated, "self-extinguishing", "MP" melamine plastic with phenolic core, raised graphic symbols and letters, ADA compliant Grade 2 Braille produced by "Graphic Blast®" engraving process as an integral part of the material. Signs shall be selected and/or specified contrasting two-color, scratch resistant, non-static, fire-retardant, washable material with a non-glare matte finish surface, unframed, with finished edges and round corners.

2. Colors: Toilet Room signage shall be Best® “White” graphics and “Blue” background, subject to approval by the Architect and/or Owner. Room signage color to be selected by Owner.
 3. Sizing: For “bidding purposes”, signs shall be typically 6" x 9" with 3/8" radius corners.
 4. Mounting: Factory prepared with vinyl foam tape or mounting holes for use with mechanical fasteners, subject to review by the Architect.
- D. Room Signs Required: Sign titles and quantities include, but are not necessarily limited to the following. Verify final number of signs and titles with the Architect and/or Owner’s Representative.
1. One (1) required for each Women’s Toilet Room.
 2. One (1) required. For each Men’s Toilet Room.
 3. One (1) at each door off of halls, corridor and passages.
 4. One (1) at each space listed in Room Finish Schedule. If more than one door to a space a sign will be required at each door.
- E. Lettering Style: Raised 1/32 inch upper case sans serif or simple serif, not less than 5/8 inch high, and not more than 2 inches high.
- F. Accessibility Requirements: Facilities and elements required to be identified as accessible shall include the International Symbol of Accessibility pictogram with verbal description, and Grade 2 Braille. Signage shall comply with applicable provisions of Title III of ADA, Article 4.30 within Appendix A to Part 36 of 28 CFR. Field area size shall be in accordance with governing code requirements for accessibility and use by persons with disabilities.

2.02 EXIT SIGNS

- A. Tactile Exit Signs: Provide interior tactile signs stating “EXIT” and complying with “ICC/ANSI - A117.1 - Standard on Accessible and Usable Buildings and Facilities” and “Title III of The Americans With Disabilities Act (ADA), Public Law 101-336”.
- B. Locations: Exit signs shall be provided adjacent to each door at the following locations.
1. An exit stairway.
 2. At the exit discharge.

2.03 BARRIER FREE SIGNS

- A. Manufacturer: Signage specified herein shall be as manufactured by Seton Identification Products, 20 Thompson Road, P.O. Box 819, Branford, CT 06405-0819, (800)571-2596 or (203)488-8059; www.seton.com.
- B. Comparable Products: Comparable equivalent signage by the following company, or other comparable manufacturer’s product may be acceptable, subject to conformance with these Specifications and the Architect’s review.
1. Allen Markings, 1130 Elmwood Avenue, Kansas City, MO 64127, (816)842-0963 or (800)825-0150; www.allendiv.com.
- C. Decal Signs: Barrier free signs at toilet partitions designated for individuals with a disability shall be Seton “Handicap Symbol Decal”, Item #35839, tear-resistant, self-adhesive vinyl single sided decal.

1. Graphics: International Symbol Accessibility sign shall have contrasting blue background and white graphics, with matte non-glare finish.
2. Size: 4" x 4".

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Furnish and install products as shown on the Drawings and/or specified herein. Special attention shall be given to, but not necessarily limited to the following:
 1. Interior- Room Identification Signage: Install signs as indicated and/or shown on the Drawings and as required.
 2. Exit Signs: Install tactile exit signs at locations as specified herein.
 3. Barrier Free Signs: Install signs for toilet compartment/partition stall doors where indicated on the Drawings for individuals with a disability.
- B. Accessory Materials: Provide all accessory materials required and necessary for complete and finished installations.
- C. ADA Accessibility Guidelines: Signage required to be with accessible designation shall comply with "Mounting Location and Height" specified within the provisions of Article 4.30 of the ADA Accessibility Guidelines.
- D. Protection: Protective covers provided by the manufacturer to protect the finishes shall not be removed until final cleaning.

END OF SECTION

SECTION 10 21 13TOILET COMPARTMENTS

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, equipment, apparatus, tools, transportation, protection and services necessary for, and reasonably incidental to the proper execution and completion of all Toilet Compartment/Partition Work, as indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Solid Color Reinforced Composite (SCRC) Toilet Partitions (floor mounted).
 - 2. Fastening Devices, Coat Hooks and Bumpers, and Hardware.
- B. Related Sections: The following items of related Work will be provided in other sections of the
 - 1. Rough Carpentry - Section 06 10 00.
 - 2. Gypsum Wallboard Construction - Section 09 29 00.
 - 3. Thin-Set Tile Work - Section 09 31 00.
 - 4. Interior Painting and Finishing - Section 09 91 23.
 - 5. Barrier Free Signs - Section 10 14 00.
 - 6. Toilet Room Accessories - Section 10 28 13.

1.02 REFERENCE SPECIFICATIONS, CODES, AND APPLICABLE STANDARDS

- A. Requirements of Regulatory Agencies: Toilet compartment/partition assemblies and layout shall comply with accessibility requirements in accordance with laws, codes, ordinances and regulations of the public authorities having jurisdiction, including “ICC/ANSI - A117.1 - American National Standard for Accessible and Usable Buildings and Facilities” and “Title III of The Americans With Disabilities Act (ADA), Public Law 101-336”.

1.03 QUALITY ASSURANCE

- A. Manufactured Units: Protect toilet compartment/partitions from all possible damage as recommended by the manufacturer.
- B. Hardware: All toilet compartments/partitions shall be provided complete with all appropriate hardware.
- C. Installer’s Qualifications: Provide a company or individual, regularly engaged in installation of products specified in this section, with not less than two (2) years’ experience.
- D. Certification: Provide a certificate of compliance attesting that all products and materials are in accordance with the specified manufacturer’s specifications.

1.04 SUBMITTALS

- A. General: Submit Shop Drawings, Product Data, and Color Samples to Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Shop Drawings: Prepare complete Shop Drawings indicating materials, fabrication details, and installation layout.
- C. Product Data: Unless otherwise indicated, submit Product Data for each type of product provided under Work of this section.
- D. Samples: Submit four (4) Samples of color chips, indicating full range of available color, markings, characteristics and finish to Architect for approval. Manufacturer's color charts and/or color swatches will not be accepted as Samples.

1.05 STANDARD PRACTICE

- A. All material incorporated in the Work shall be of type and quality specified herein, subject to the Architect's review. Methods of preparation, construction, and installation shall comply with manufacturer's printed specifications or instructions.

1.06 MATERIAL DELIVERY AND STORAGE

- A. Delivery: Deliver to the site all materials in protective crates and wrappings, clearly labeled to facilitate checking. Unload in areas designated by the General Contractor.
- B. Storage: Store materials at the site off the ground in properly protected dry storage facilities, until ready for use.

1.07 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense, any imperfections which may develop during the warranty period and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of the Owner's acceptance.
- B. SCRC Toilet Partitions: Obtain from the toilet partition manufacturer a twenty-five (25) year written warranty against breakage, corrosion, delamination, and defects in factory workmanship, of doors, panels and pilasters, at no additional charge to the Owner.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Solid Color Reinforced Composite Toilet Compartments/Partitions (Floor Mounted):
 - 1. Bobrick Washroom Equipment, Inc., 11611 Hart Street, North Hollywood, CA 91605-5882, (818)982-9600 or (818)982-9600; www.bobrick.com.
- B. Comparable Products: Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.

2.02 SOLID COLOR REINFORCED COMPOSITE TOILET COMPARTMENTS/PARTITIONS

- A. Products: Partitions specified herein shall be “Sierra Series” type style partitions as manufactured by Bobrick, or comparable equivalent manufacturers as specified herein.
- B. Partitions and Doors:
 - 1. Partitions: Floor mounted and overhead braced type, flush, solid color reinforced composite (SCRC) units, with Bobrick Graffiti-Off coating, thermoset and integrally fused into homogenous piece. High density polyethylene (HDPE) or high density polypropylene are not acceptable. All items of construction shall conform with the Drawings, approved Shop Drawings, manufacturer’s printed specifications, and these Specifications.
 - 2. Doors, Partitions and Pilasters:
 - a. Material: Certified per ASTM Standard E84, having a Flame Spread of less than 75 and Smoke developed less than 450.
 - b. Thickness:
 - 1) Pilasters and Doors: 3/4 inch.
 - 2) Panels and Screens: 1/2 inch.
 - c. Typical Doors and Partitions: 58" high, set 12" above the floor line, unless otherwise noted.
 - 3. Privacy Style Partitions: No sightlines with gap-free interlocking doors and stiles routed 0.300 inches (7.6 mm) from the edge to allow for 0.175 inch (4.4 mm) overlap to prevent line-of-sight into the toilet compartment. Privacy strips fastened or adhered onto the partition material are not acceptable.
 - 4. Wall Brackets: Solid, continuous, extruded aluminum brackets for full height of panels, subject to review by the Architect.
 - 5. Provisions for Individuals with a Disability: Where stalls are indicated on Drawings for individuals with a disability, each stall shall have an out-swinging door providing a 32" wide clear opening.
 - 6. Urinal Screens: Where urinal screens are indicated on Drawings, screens shall be fabricated similar to partitions, floor supported, and shall project a minimum of 18" from wall, unless otherwise indicated.
 - 7. Pilasters: Flush type, of same material and construction as panels. Pilasters shall be of widths required, but not less than 10", and 82" high. Bottoms of pilasters shall be fitted with a leveling cross bar, welded in place, and screw leveling devices for securing to floor. Pilaster bottom and anchorage shall be concealed by a 4" high shoe. Shoes and anchor plates shall be AISI Type 304, 22 gauge stainless steel, finish to match hardware.
 - 8. Headrails: Anti-grip design, one piece extruded anodized aluminum headrails not less than 0.065 inch (1.65 mm) thick. Headrails shall be secured at top of pilasters in accordance with manufacturer’s printed specifications, and shall be extended to walls and to adjacent partitions in all cases.
 - a. Headrail Brackets: 18 gauge stainless steel.

9. Colors: As selected by the Architect and/or Owner.
10. Fittings and Fasteners: All fittings, exposed nuts, bolts and other fastenings shall be stainless steel. All exposed fastenings shall be theftproof.

C. Hardware:

1. General: Provide all required and necessary hardware and fittings for a complete installation, including door pulls, hinges and pivots capable of holding doors open when not in use, slide bar latches with rubber faced bumper and latch keepers, combination coat hook and rubber tipped bumper. All hardware shall be Type 304, polished stainless steel.
 - a. All door hardware shall be attached through sleeve bolts.
 - b. Hardware shall permit quick emergency access.
2. Hinges: Provide 11 gauge stainless steel hinges. Top hinge shall be a self closing action type. Provide self-closing hinges where stalls are indicated on the Drawings for individuals with a disability.
3. Latches (ADA Type): Provide lever type door hardware at toilet room stalls for individuals with a disability, where such stalls are indicated on the Drawings.
4. Door Pulls: Manufacturer's standard unit for doors. Provide door pulls on both faces of compartment doors for individuals with a disability, where such stalls are indicated on the Drawings.
5. Bumpers: Provide wall mounted bumpers for out-swinging compartment doors.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Inspection: Installer shall inspect and examine areas to receive toilet compartments/partitions and urinal screens for correct height and spacing of anchorage/blocking and plumbing fixtures that may affect installation of partitions. Report any discrepancies to the Architect.
- B. Field Measurements: Take complete and accurate measurements of complete toilet compartments/partitions locations to ensure correct installation.
- C. Acceptance of Field Conditions: Start of Work constitutes acceptance of job. Do not begin installation of compartments/partitions until conditions are satisfactory.

3.02 INSTALLATION

- A. Erection:
 1. Compartments/partitions shall be erected in accordance with Shop Drawings and the manufacturer's current written recommendations and installation instructions, subject to review by the Architect.
 2. All Work shall be true, square and plumb, level and securely anchored. Center stalls on fixtures unless otherwise shown or specified. Secure pilasters for floor mounted partitions rigidly to floors and overhead bracing. Secure panels to walls with brackets, and screwed to pilasters with theftproof/vandal fasteners.

B. Drilling, Cutting and Fitting:

1. Drill, cut and fit all Work as required for proper installation of this Work, and as required for passage of pipe and similar penetrations.
2. Drill and cut concrete as required for installation, or when applicable, furnish all necessary inserts to the Concrete Contractor and supervise the placing of inserts.

C. Partitions for Individuals with Disabilities: Where applicable, such as at stalls for individuals with a disability, Work shall be in accordance with current governing code requirements.D. Adjustments:

1. Adjust hardware and accessories for proper operation and working condition.
2. Toilet compartment/partition doors shall swing open approximately 30 degrees when unlatched.
3. Clearance at vertical edges of doors shall be uniform top to bottom.

E. Finished Work: No evidence of drilling, cutting or patching shall be visible on the finished Work.F. Cleaning: Finished surfaces of toilet compartments/partitions and accessories shall be cleaned after installation and left free of imperfections.G. Damaged Materials: Replace all defective or damaged products.3.03 CLEAN-UPA. Work Required: Clean-up any Work soiled in the performance of the Work under this section.B. Debris and Waste Materials: During progress of the Work, upon completion of Work, and before final acceptance of the Work, keep the premises free of debris and waste materials resulting from Work of this section. Remove all debris and rubbish to central area designated by General Contractor, for general clean-up by General Contractor, or if directed by General Contractor to remove from the site and legally dispose.C. Unused Materials, Tools, and Equipment: Upon completion of Work and before final acceptance of the Work, remove all unused materials, tools, and equipment from the site.3.04 MAINTENANCE INSTRUCTIONS

A. Furnish the Owner with all manufacturer's printed service and parts manuals necessary for proper cleaning and maintenance of the products specified herein.

END OF SECTION

SECTION 10 28 13TOILET ACCESSORIES

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, equipment, apparatus, tools, transportation, protection and services necessary for, and reasonably incidental to the proper execution and completion of all Toilet Accessories Work, as indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:
1. Grab Bars.
 2. Toilet Paper Dispenser.
 3. Framed Mirror.
 4. Shelves.
 5. Sanitary Napkin Disposal.
 6. Soap Dispensers.
 7. Electric Hand Dryer.
 8. Coat Hook.
 9. Shower Seats.
 10. Insulation Kits for Lavatories with Exposed Piping.
- B. Related Sections: The following items of related Work will be provided under other sections of the Specifications as indicated:
1. Masonry - Section 04 20 00.
 2. Rough Carpentry - Section 06 10 00.
 3. Gypsum Wallboard Construction - Section 09 29 00.
 4. Thin-Set Tile Work - Section 09 31 00.
 5. Interior Painting and Finishing - Section 09 91 23.
 6. Toilet Partitions - Section 10 21 13.
 7. Plumbing - Division 22.
 8. Electrical - Division 26.

1.02 REFERENCE SPECIFICATIONS, CODES, AND APPLICABLE STANDARDS

- A. Requirements of Regulatory Agencies: Furnish toilet accessories in accordance with laws, codes, ordinances and regulations of the public authorities having jurisdiction, including Title III of The Americans With Disabilities Act (ADA), Public Law 101-336.

1.03 SUBMITTALS

- A. General: Submit Shop Drawings, Product Data, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Shop Drawings: Submit fully detailed layout and setting drawings, illustrative plates or drawings, and Supplementary Shop Drawings of all items.

1.04 MATERIAL DELIVERY AND STORAGE

- A. Delivery: Deliver only acceptable materials to the site in original boxes, crates, and wrappings, clearly labeled with all pertinent information to facilitate checking.
- B. Storage: Materials shall be stored at the site, off the ground in properly protected dry storage facilities, until ready for use. Damaged materials will not be acceptable, and shall be removed from the site.
- C. Lead Time: When phenolic and plastic laminated products are specified, allow not less than six (6) weeks lead time.

1.05 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and any damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

PART 2 - PRODUCTS

2.01 TOILET ROOM ACCESSORIES - GENERAL

- A. Manufacturer: Unless otherwise noted, items specified herein represent commercial quality products manufactured by the following manufacturer, and illustrate the type, function, size, operation, material, finish and constructions required.
 - 1. Bobrick Washroom Equipment, Inc., 11611 Hart Street, North Hollywood, CA 91605-5882, (818)982-9600; www.bobrick.com.
- B. Comparable Manufacturers: For specified "Bobrick" products, equivalent products by the following manufacturers may be acceptable, subject to compliance with the Specifications and the Architect's review. The standard of quality in materials, details, fit and finish shall be equal to the manufacturer and products specified herein. Products of lesser quality shall not be approved.
 - 1. American Specialties, Inc., 441 Saw Mill River Road, Yonkers, NY 10701-4913, (914)476-9000; www.americanspecialties.com.
 - 2. Bradley Corporation, Building Specialties Group, N106 W. 13500 Bradley Way, Germantown, WI 53022, (800)203-3420 or (262)242-1583; www.bradleycorp.com.

- C. Material and Finish: Unless otherwise specified, all items shall be of Type 304 stainless steel with satin finish.
- D. Supplementary Hardware: Furnish each item complete with non-corrosive fasteners, anchorage, trim, and back-up plates as required for securing to walls (concrete, masonry and/or drywall). Furnish all incidental parts.
- E. Fasteners: Provide vandal-resistant fasteners wherever exposed fasteners are required.
- F. Locks: Toilet room accessories equipped with tumbler locks shall be keyed alike with all other locked toilet room accessories, with the exception of coin boxes in vending equipment. All tumbler locks shall be fastened to accessories with lock nuts. Fastening locks to units with spring clips is not acceptable.
- G. Product Identification Labels: Products shall have either a printed waterproof label or stamped nameplate indicating manufacturer's name and product model number. Identification labels shall not be on the exposed finish surface of the product.

2.02 TOILET ROOM ACCESSORIES

- A. Grab Bars: Bobrick No. B-6806.99 x 42" for sides, 36" for back wall, and 18" vertical grab bar, 1-1/2" O.D., of 18 gauge wall thickness, stainless steel tubing that provide 1-1/2" wall clearance. All specified stainless steel materials shall be 18-8 S, Type 304. Wall and partition mounted grab bars shall have peened non-slip gripping surface and 1/8" thick stainless steel plate concealed mounting flanges (including 22 gauge stainless steel snap-on flange covers). Grab bar ends shall be No. 2562 Anchor Plates. Refer to Drawings for locations of grab bars.
- B. Toilet Paper Dispensers:
 - 1. Multi-Roll Units: Bobrick No. B-2892 Surface-Mounted Twin Jumbo Roll Toilet Tissue Dispenser; all-welded construction, and equipped with tumbler lock. Door and cabinet shall be of 18-8, type 304, 18 gauge stainless steel. Dispensing mechanism shall be capable of holding and dispensing two (2) toilet tissue rolls up to 10" diameter.
- C. Framed Mirrors: Wall mounted, Model SMS 1836, manufactured by Sentry Mirror (877)937-4435, www.sentrymirror.com.
- D. Stainless Steel Shelves: Surface mounted, Bobrick No. B-239 Series, 18 gauge stainless steel. Shelf shall be 34"L x 8"W with 3/4" edges, with front edge hemmed. Shelf mounting brackets shall be 16 gauge stainless steel welded to shelf, with no visible weld marks on shelf. Spring-Loaded rubber cams with anti-slip coating mop/broom holders. Hooks shall be 18-8, type 304, 12 gauge stainless steel.
- E. Sanitary Napkin Disposals:
 - 2. Single Disposal Units: Bobrick No. B-270, ConturaSeries® Surface-Mounted Sanitary Napkin Disposal, 18-8 S, Type 304, 22 gauge stainless steel, surface-mounted type units to serve individual toilet compartments. Container shall be of all-welded construction. Cover shall be drawn, one-piece, seamless construction and secured to container with a full-length stainless steel piano-hinge. Container shall have integral finger depression for opening cover.

F. Soap Dispensers:

3. Surface Mounted: Bobrick No. B-2111 Wall Mounted, Soap Dispenser, welded 18-8, type 304, 22 gauge stainless steel with satin finish. Refillable 40 fl. Oz. container. Valve shall be operable with one hand and with less than 5 pounds of force to comply with barrier-free accessibility guidelines.

G. Electric Hand Dryers:

4. Surface Mounted: Surface-Mounted High Speed Hand Dryer Model No. 0199-1-93 as manufactured by American Specialties, Inc., (914)476-9000 or (914)476-0688, www.americanspecialties.com. Cover shall be heavy-duty, one piece formed 18 gauge stainless steel with satin finish.

H. Coat Hook: Bobrick Model No. B-232 x 24 hook strip with 18-8, type 304, 12 gauge stainless steel hooks on 18-8, type 304, 18 gauge stainless steel mounting strip.I. Shower Seat: Bobrick Model No. B-5181 Reversible Solid Phenolic Folding Shower Seat, one-piece, 1/2" thick solid phenolic with matte finish, antique white-colored, melamine surfaces and black phenolic resin core.J. Insulation Kits: Lavatories with exposed piping shall be provided with protective Undersink Piping Covers, specified herein, complete with all accessories required, or comparable equivalent manufacturer's product, subject to review by the Architect.

1. Manufacturer: IPS® Corporation, 202 Industrial Park Lane, Collierville, TN 38017, (800)340-5969 or (901)853-5001; www.ipscorp.com.
2. Undersink Protective Pipe Covers: ADA-compliant (Article 4.19.4), wheelchair accessible lavatory P-trap and angle valve assemblies shall be covered with molded vinyl, antimicrobial. TRUEBRO® - LAV GUARD® 2 E-Z Series waste and supply piping undersink pipe safety covers. Cover shall have internal trim feature for square and clean trimming, internal rib fasteners, and built-in, concealed fasteners (cable-tie fasteners shall not be permitted).
 - a. Material: Soft, resilient molded vinyl.
 - b. Nominal Wall: 1/8" constant with internal ribs.
 - c. Trimming (E-Z Series): Internal E-Z Tear-To-Fit trim feature for installation without tools.
 - d. Fasteners (E-Z Series): Internal E-Z Grip fasteners, reusable.
 - e. Paintability: Material shall be paintable with latex paint where required by Drawings and/or field conditions to match adjacent material colors.
 - f. Burning Characteristics: Self extinguished 0 sec (ATB) mm (AEB), in accordance with ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
 - g. Bacteria/Fungus Resistance: In accordance with ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi. Result: 0 growth.
 - h. Color: Manufacturer's standard "China White", subject to approval by the Tenant, Architect and/or Owner.

3. Compatibility: Contractor shall coordinate with Plumbing Contractor for compatible complete design kit series required to fit piping assemblies.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Check wall openings for dimensions, plumbness of blocking or frames that would affect installation of recessed accessories. For surface mounted accessories check condition of wall and confirm installation of backing within wall.
- B. Verify spacing of plumbing fixtures and toilet compartments/partitions that affect installation of toilet room accessories.

3.02 INSTALLATION

- A. General:
 1. Contractor shall install all accessories supplied by the Owner, refer to the Drawings.
 2. Comply with ADA and code requirements for facilities for individuals with a disability. Should governing code requirements differ from any specified herein, the more stringent requirement shall be met.
 3. Protective covers installed by manufacturers to protect the finishes, shall not be removed until final cleaning.
- B. Locations and Methods of Installation: Install accessories at locations and heights indicated on the Drawings, straight, plumb and level and in accordance with manufacturer's installation instructions. Install items with non-corrosive anchoring devices. Installation methods shall conform to manufacturer's recommendations for backing and proper support. Conceal evidence of drilling, cutting, and fitting to room finish. Fit flanges of accessories snugly to wall surfaces.
- C. Grab Bars: Mount grab bars to walls and partitions with supplied flanges and fasteners. Installed grab bars shall be anchored so as to withstand a force of not less than 300 pounds for five (5) minutes in any direction.
- D. Lavatory Insulation Kits: Install on exposed piping at each lavatory.
- E. Electric Hand Dryers: Furnish to the Electrical Contractor for installation.

3.03 CLEAN-UP

- A. Work Required: Clean-up any Work soiled in the performance of the Work under this section.
- B. Debris and Waste Materials: During progress of the Work, upon completion of Work, and before final acceptance of the Work, keep the premises free of debris and waste materials resulting from Work of this section. Remove all scrap, construction debris and rubbish to central area designated by General Contractor, for general clean-up by General Contractor, or if directed by General Contractor to remove from the site and legally dispose.
- C. Unused Materials, Tools, and Equipment: Upon completion of Work and before final acceptance of the Work, remove all unused materials, tools, and equipment from the site.

3.04 FIELD INSPECTION

- A. Toilet Room Accessories: Engage the services of the approved manufacturer's inspection service, to inspect the installation of all Toilet Room Accessories specified herein, and report any installation adjustments required to place all accessories in perfect working order, at no cost to the Tenant and/or Owner.

3.05 MAINTENANCE INSTRUCTIONS

- A. Furnish the Owner with all manufacturer's printed data, including service and parts manual, necessary for proper cleaning and maintenance of the products specified herein.

END OF SECTION

SECTION 10 44 00FIRE PROTECTION SPECIALTIES

The requirements of the "General Conditions", the "Supplementary Conditions", and "Division 1" sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, equipment, apparatus, tools, transportation, protection and services necessary for, and reasonably incidental to the proper execution and completion of all Fire Protection Specialties Work, as indicated on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Install Portable Fire Extinguishers and Accessories.
 - 2. Provide and install Fire Extinguisher Cabinets.
- B. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:
 - 1. Masonry - Section 04 20 00.
 - 2. Gypsum Wallboard Construction - Section 09 29 00.
 - 3. Interior Painting and Finishing - Section 09 91 23.

1.02 REFERENCE SPECIFICATIONS, CODES, AND APPLICABLE STANDARDS

- A. Requirements of Regulatory Agencies: Furnish miscellaneous accessories in accordance with laws, codes, ordinances and regulations of the public authorities having jurisdiction, including Title III of The Americans With Disabilities Act (ADA), Public Law 101-336.

1.03 QUALITY ASSURANCE

- A. General: All materials, articles, accessories incorporated in the Work shall be type and quality specified herein, and subject to the Architect's review. Methods of preparation, construction and installation of such materials, articles and accessories shall be strictly in accordance with the accepted standard practices, manufacturer's printed specifications and/or instructions, the Architect's Drawings and Specifications, and as directed by the Architect.
 - 1. Provide and install NFPA compliant portable fire extinguishers with labels listing type, rating and classification by an independent testing agency acceptable to authorities having jurisdiction.
- B. Manufacturer: Provide fire extinguishers, cabinets and accessories by a single manufacturer.

1.04 SUBMITTALS

- A. General: Submit Shop Drawings, Product Data and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Shop Drawings: Submit fully detailed layout and setting drawings, illustrative plates or drawings, and Supplementary Shop Drawings of all items.

- C. Product Data: Submit Product Data for each manufacturer's factory/shop fabricated product specified under Work of this section.
- D. Samples: Submit 4" x 4" Samples of fire extinguisher cabinet colors and/or finishes specified herein, for approval PRIOR to installation. Written approval shall be secured from the Architect, and installed materials shall match approved Samples.

1.05 MATERIAL DELIVERY AND STORAGE

- A. Delivery: Deliver only acceptable materials to the site in original boxes, crates, and wrappings, clearly labeled with all pertinent information to facilitate checking.
- B. Storage: Materials shall be stored at the site, off the ground in properly protected dry storage facilities, until ready for use. Damaged materials will not be acceptable and shall be removed from the site.

1.06 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and any damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.
- B. Fire Extinguishers: In addition to the above warranty, the fire extinguisher manufacturer shall provide industry standard of not less than a six (6) year written warranty covering materials and workmanship, at no charge to the Owner.

PART 2 - PRODUCTS

2.01 PURCHASE BY OWNER

- A. Products as specified in the "Responsibilities Chart" noted on the Drawings and in Specification Section 01 64 00 shall be purchased by the Owner. No substitutions will be permitted.

2.02 MANUFACTURER

- A. Acceptable Manufacturer: Fire Extinguishers and Accessories and Fire Extinguisher Cabinets specified herein shall be as manufactured by Larsen's® Manufacturing Company, Minneapolis Division, 7421 Commerce Lane N.E., Minneapolis, MN 55432, (763)571-1181 or (800)527-7367; www.larsensmfg.com.

2.03 PORTABLE FIRE EXTINGUISHERS

- A. Fire Extinguishers: Larsen's®, MP Series, Multi-Purpose Dry Chemical extinguishers for Class A, B and C fires.
 - 1. Type: Extinguishers as specified herein shall be portable, hand-carried type, pressurized dry chemical fire extinguishers, with self-closing hand valve, discharge hose, pressure gauge, in manufacturer's standard container with corrosion and impact resistant polyester/epoxy "red" paint finish. Units shall contain specially fluidized and siliconized mono ammonium phosphate powder.
 - a. Bracket Hung Units: Model Number MP10, 10 lbs. nominal capacity, UL Rating 2A-10B:C.

- b. Cabinet Stored Units: Model Number MP10, 10 lbs. nominal capacity, UL Rating 2A-10B:C.
 - 2. Miscellaneous Requirements: Fire extinguishers shall be provided with test, refill schedules, procedures, and recertification requirements in accordance with National Fire Protection Association, NFPA 10 - Standard for Portable Fire Extinguishers, latest edition.
- B. Fire Marshal's Approval: Type, size and quantities of fire extinguishers as indicated on the Drawings and/or specified herein shall be subject to review and approval by the Fire Marshal.
- C. Accessories:
 - 1. Mounting Brackets: Provide manufacturer's recommended and compatible standard mounting extinguisher brackets and anchors. Brackets shall be of size and design to accommodate the accepted manufacturer's fire extinguishers.
 - 2. Signage: Provide sign above each extinguisher to identify the locations of fire extinguishers as required and directed by local jurisdiction and/or authorities.

2.04 FIRE EXTINGUISHER CABINETS

- A. Fire Extinguisher Cabinets: Larsen's® Architectural Series, "Model No. 2409-R7", semi-recessed steel cabinet box, complete with extinguishers as specified herein.
 - 1. Cabinet Dimensions: Inside box dimensions 24" high x 9-1/2" wide x 6" deep, subject to the Architect's review.
 - 2. Rough Opening Dimensions: 25" high x 10-1/2" wide x 5" deep.
 - 3. Door Style: Full panel with clear tempered safety glass.
 - a. Lettering Style: Vertical lettering "FIRE EXTINGUISHER".
- B. Fire Extinguisher Cabinets at Office Breakroom: Larsen's® Architectural Series, "Model No. 2409-R6", semi-recessed steel cabinet box, complete with extinguishers as specified herein.
 - 1. Cabinet Dimensions: Inside box dimensions 24" high x 9-1/2" wide x 6" deep, subject to the Architect's review.
 - 2. Rough Opening Dimensions: 25" high x 10-1/2" wide x 4" deep.
 - 3. Door Style: Full panel with clear tempered safety glass.
 - b. Lettering Style: Vertical lettering "FIRE EXTINGUISHER".
- C. Fire Extinguisher Cabinets in Truckwash: Larsen's® Architectural Series, "Model No. SS2409-SM", Surface Mount stainless steel cabinet box, complete with extinguishers as specified herein.
 - 1. Cabinet Dimensions: Inside box dimensions 27.5" high x 13" wide x 6" deep, subject to the Architect's review.
 - 2. Door Style: Solid Stainless Steel Door Style.
 - c. Lettering Style: Vertical lettering "FIRE EXTINGUISHER".
- D. Fire Marshal's Approval: Size, type, lettering style and color, and quantities of fire extinguisher cabinets as indicated on the Drawings and/or specified herein shall be subject to review and approval by the Fire Marshal.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Fire Extinguisher Cabinets - Rough Openings: Verify that rough openings for fire extinguisher cabinets are correctly sized and located.

3.02 INSTALLATION

- A. General: Provide products specified herein in accordance with approved Shop Drawings, for installations as indicated on the Drawings and/or required.

1. Install items included in this section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.
2. Comply with ADA and code requirements for facilities for individuals with a disability. Should governing code requirements differ from any specified herein, the more stringent requirement shall be met.
3. Fire extinguisher cabinets and mounting brackets for wall hung and/or steel column hung fire extinguishers shall be securely anchored and fastened to structure, square and plumb, and in compliance with manufacturer's instructions.
4. Protective covers installed by manufacturers to protect the finishes, shall not be removed until final cleaning.

- B. Fire Extinguishers: Provide portable fire extinguishers for wall and/or column mounted installations on mounting brackets and for fire extinguisher cabinets, in quantities as acceptable by the Fire Marshal.

1. General: Install fire extinguishers and identifying signs in accordance with local authorities, ADA guidelines, and manufacturer's recommendations, at exact locations as determined and designated by the Fire Marshal.
2. Inspection: Verify servicing, charging and tagging of all fire extinguishers.
3. Requirements: Contractor shall coordinate with the Owner's Representative and the Fire Marshal on the locations of fire extinguishers prior to installation. Provide Portable Fire Extinguishers in accordance with the following.
 - a. Fire extinguishers shall not be obstructed or obscured from view.
 - b. Fire extinguishers shall be conspicuously located where they will be readily accessible and immediately available in the event of a fire. Preferably fire extinguishers shall be located along the normal paths of travel including exits from areas.

- C. Fire Extinguisher Cabinets: Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim, and to comply with manufacturer's instructions.

3.03 MAINTENANCE INSTRUCTIONS

- A. Furnish the Owner and/or Tenant with all manufacturer's printed data, including service and parts manual, necessary for proper maintenance of the products specified herein.

END OF SECTION

SECTION 10 50 00LOCKERS

The requirements of the "General Conditions", the "Supplementary Conditions", and "Division 1" sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Furnish all labor, materials, equipment, and services necessary to furnish lockers as indicated on the Drawings and specified herein.
- B. Related Sections: The following items of related Work will be provided in other sections of the Specifications:
 - 1. Installation of Lockers - Section 06 20 00.

1.02 SUBMITTALS

- A. General: Submit Shop Drawings and Samples to Architect for review, in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Shop Drawings: Prepare complete Shop Drawings indicating materials, fabrication details, and installation layout.
 - 1. Drawings shall show metal lockers in dimensioned relation to adjacent surfaces. Illustrate details, method of installation, fillers, trim, concrete base, and accessories.
 - 2. Drawings shall include locker numbering sequence information.
 - 3. Submit product data and installation instructions.
- C. Samples: Submit 4" x 4" color Samples of metal materials to be used for fabrication of lockers for approval PRIOR to installation. Written approval must be secured from the Architect. Installed materials shall match approved Samples.

1.03 QUALITY ASSURANCE

- A. Uniformity: Provide lockers that are standard products of a single manufacturer, with interchangeable like parts. Include all necessary mounting accessories, fittings, and fastenings.

1.04 JOB CONDITIONS

- A. Contractor shall take all necessary field measurements to assure proper fitting of the work to the actual conditions at the building.

1.05 MATERIAL DELIVERY AND STORAGE

- A. Delivery: Deliver only acceptable materials to the site, fully assembled in original boxes, crates, protective wrappings, clearly labeled with all pertinent information, to facilitate checking.

- B. Storage: Store materials at the site, off the ground and in properly protected dry storage facilities until ready for use. Damaged materials will not be acceptable, and shall be removed from the site.

1.06 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and any damage to other Work caused by such imperfections or by the repairing of same. The period of warranty shall be not less than one (1) year from date of Owner's acceptance of the installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Republic Storage Systems, LLC, 1038 Belden Avenue, NE, Canton, OH 44705, (800)477-1255, www.republicstorage.com.
- B. American Locker Security Systems, Inc., 608 Allen Street, Jamestown, NY 14701-3966, (800)828-9118, www.americanlocker.com.
- C. Other comparable manufacturer subject to review by Architect.

2.02 LOCKERS

- A. General: Factory assembled metal lockers of size, types, materials, construction, as specified herein, shall be subject to the approval of the Architect and Owner. Lockers shall be furnished with all fasteners, anchorage, trim, and fillers to provide a complete finished installation as indicated on the drawings and required by field conditions.
- B. Product Model: Republic Storage, "Standard".
 - 1. Two Tier, 12"W x 12"D x 36"H.
- C. Locker Material, Finish and Gauges: Lockers shall be one-coat electroplated zinc carbon steel with stainless steel hardware. Electroplated steel parts shall be factory finished with baked-on epoxy primer and finish enamel.
 - 1. Frames and Doors: Not less than 16 gauge.
 - 2. Sides: Not less than 24 gauge.
 - 3. Shelves, Tops, Bottoms and Backs: Not less than 24 gauge.
- D. Colors: All body parts shall be manufacturer's standard color, to be selected by Architect and/or Owner.
- E. Frame Fabrication: Welded overlapping construction; channel formed with double thickness for lock and cash housing. Frames shall be channel formed and interlocked with intermediate cross members.
- F. Doors and Hardware: Textured steel, self-closing, rubber cushioned, with louvers, channel box formed with reinforced ends returned and welded. Doors shall have not less than two (2) 2", S-knuckle hinges, stainless steel door closure and handle. Doors shall be ventilated by louvers on the face, top and bottom.

- G. Locks: Constructed of type 304 nickel bearing stainless steel and other non-corrosive metals. Locks shall have safety interlock with frame upright between locker door and coin mechanism.
 - 1. Padlocks: Furnish positive pre-locking device for installation of key type or combination type padlock.
- H. Body: Locker body shall be of flanged and reinforced construction. Back of locker shall be perforated for ventilation.
- I. Assembly: Lockers shall be totally factory assembled by fastening frame and doors with corrosion resistant mechanical fasteners to fully assembled body modules.
- J. Accessories:
 - 1. Trim, Fillers, and Closure Pieces: Furnish all necessary trim, fillers, and closure pieces, of not less than 18 gauge steel sheet, factory fabricated and finished to match locker units. Furnish materials as required by drawings and/or field conditions to provide complete and finished installations. Finish and color shall match locker frames.
 - 2. Key Numbering Sets: Furnish locker key numbering sets for numerical identification of lockers, subject to the approval of the Architect and/or Owner.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Deliver lockers to the Carpentry Contractor for installation in accordance with the manufacturer's recommendations.
- B. Protective coverings installed by the manufacturer to protect the finishes shall not be removed until final cleaning.

END OF SECTION

SECTION 11 13 00LOADING DOCK EQUIPMENT

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Furnish all labor, materials, equipment, and services required for Loading Dock Equipment shown on the Drawings and as specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Install Edge-of-Dock Mechanical Levelers.
 - 2. Install Wheel Chocks and Accessories.
- B. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:
 - 1. Concrete Work - Sections 03 00 50 and 03 30 00.
 - 2. Miscellaneous Metal Work - Section 05 50 00.
 - 3. Overhead Coiling Doors - Section 08 33 23.
 - 4. Field Painting - Section 09 91 13.
 - 5. Metal Building Systems - Section 13 34 19.

1.02 QUALITY ASSURANCE

- A. General: All materials, articles, accessories incorporated in the Work shall be type and quality specified herein, and subject to the Architect’s review. Methods of preparation, construction and installation of such materials, articles and accessories shall be strictly in accordance with the accepted standard practices, manufacturer’s printed specifications and/or instructions, the Architect’s Drawings and Specifications, and as directed by the Architect.
- B. Reference Specifications: Except as otherwise specified herein, materials and workmanship shall conform to the following current specifications as amended to date.
 - 1. American Welding Society (AWS), D1.1, Structural Welding Code - Steel.
- C. Equipment Approach and Positioning: Contractor shall review the Architect’s Drawings and Specifications in order to provide products specified herein with the proper and correct positioning and projections in accordance with approved Shop Drawings, and as required by the Drawings and/or field conditions.

1.03 CERTIFICATION OF WELDERS

- A. Certification by a recognized, Independent Laboratory shall be furnished to Architect for all welders working on fabrication and/or erection PRIOR to starting Work. All welding shall be performed by welders who have qualified by tests prescribed in "Standard Qualification Procedure" of the AWS to perform the type of Work required.
- B. Perform all welding in accordance with the recommendations of the American Welding Society (AWS). Welds shall be solid and homogeneously a part of the metals joined, free from pits or incorporated slag or scale. Surfaces of weld shall be smooth and regular, and shall be of full area indicated or required to develop the required strength of the joint. Grind all welds exposed in the finish Work smooth, flush with adjacent surfaces, filleted at angular connections, unless otherwise specified.

1.04 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

PART 2 - PRODUCTS

2.01 PURCHASE BY OWNER

- A. Products as specified in the "Responsibilities Chart" noted on the Drawings and in Specification Section 01 64 00 shall be purchase directly by the Owner. No substitutions will be permitted.

2.02 EDGE-OF-DOCK MECHANICAL LEVELERS

- A. Manufacturer: DLM Division of Systems, LLC, W194N11481 McCormick Drive, Germantown, WI 53022, (800)643-5424, www.loadingdocksystems.com.
 - 1. Model: Edge-of-Dock Model #NL-6620.
- B. General: Mechanical EOD hinged lip leveler. Unit shall conform to ANSI/MH14.1 1987 performance requirements.
- C. Construction: Lip and ramp section to be minimum 3/8" thick steel safety tread plate on 20,000 lb. capacity unit, 50,000 PSI yield strength.
- D. Product Finish: Edge-of-Dock Leveler shall be prime painted followed by enamel gray paint.
- E. Manual Operation: Lever style activated lip section of dock leveler to be raised by dock attendant with lever bar handle supplied by manufacturer. The attendant, while standing on the dock, positions the lever in the operating slot and pulls the lever to a position that is approximately 50 degrees from the dock face. Operating range shall be 5" above dock and 5" below dock.
- F. Out of Level Compensation: Leveler platform shall be designed to compensate for canted truck beds up to 4" and rear edge remains flush with the floor to eliminate pinch points.
- G. Float Compensation: Unit shall be designed to float allowing for vertical carrier deflection when the lip is in contact with the truck bed.

- H. Installation: Unit shall be shipped completely assembled and ready for installation by Contractor. Edge-of-Dock Leveler shall be welded securely to an embedded steel channel in the dock face and then anchored to the dock face.
- I. Bumpers: Unit shall include two (2) 4" x 12" x 13" bumper block assemblies with factory installed molded rubber bumpers. Bumpers project 15".

2.03 WHEEL CHOCKS AND ACCESSORIES

- A. General: Wheel chocks and accessories shall fully comply with the requirements of OSHA Specifications 1910.178 (k), and as specified herein.
- B. Wheel Chock (Laminated Rubber Pad Assemblies): DLM Model 88-8, premium extra heavy-duty construction fully reversible wheel chocks, approximately 8" wide x 8" high x 8" long, weight 15 pounds. Wheel chocks shall be "black" recycled laminated rubber pads contoured to fit tires, assembled on 3/4" bolts and compressed between 1/4" steel plates, complete with chain attached to chock. Provide not less than two (2) wheel chocks at each truck dock door.
 - 1. Safety Accessories:
 - a. Chains and Storage Brackets: Provide for each wheel chock, standard 15'-0" long security chain, 3/16" proof coil chain with zinc finish, and chain attachment links. Chain weight shall be 0.4 pounds per lineal foot. Provide WC-Hanger (5" x 3" x 14") Wheel Chock Wall Hangers, manufactured from 12 gauge steel and powder coated "Black".

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General:
 - 1. Truck Dock Equipment and Accessories shall be installed in accordance and compliance with the manufacturer's printed detailed instructions and/or directions and the approved Shop Drawings, by a factory authorized installer.
 - 2. Use galvanized steel bolts, nuts and washers. Use metallic type expansion sleeves for securing bolts to concrete and/or masonry, inserted in proper size holes made with rotary type drills.
- B. Dock Levelers: Coordinate Work with Concrete Contractor.
- C. Wheel Chocks and Accessories: Install wheel chocks and safety accessories, including safety signage, chains and storage brackets to hang on walls at locations in compliance with OSHA requirements.

3.02 CLEAN-UP

- A. Work Required: Clean-up any Work soiled in the performance of Work under this section.
 - 1. Prefinished exposed finish surfaces shall be cleaned using non-abrasive materials and methods recommended by manufacturer of material or product being cleaned.
- B. Debris and Waste Materials: During progress of the Work the premises shall be kept free of all debris and waste materials resulting from the Work of this section. All debris and rubbish shall be removed from the site and legally disposed. Upon completion of Work and before final acceptance of the Work, all debris, rubbish, unused materials, tools, and equipment shall be removed from the site.

#5147

3.03 INSTRUCTIONS FOR EQUIPMENT OPERATION

- A. Upon completion of Work, provide all manufacturer's written information to the Tenant and/or Owner, necessary for proper operation of the equipment. Instruct the Owner personnel with operating characteristics of equipment.

END OF SECTION

SECTION 12 36 23.13PLASTIC LAMINATE-CLAD COUNTER

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Furnish all labor, materials, equipment, and services necessary for Plastic Laminate-Clad Counter Work indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Standard Plastic Laminate-Clad Counter.
- B. Color Selections: Refer to the Drawings.
- C. Related Sections: The following items of related Work will be performed under other sections of the Specifications:
 - 1. Rough Carpentry - Section 06 10 00.
 - 2. Finish Carpentry - Section 06 20 00.
 - 3. Gypsum Wallboard Construction - Section 09 29 00.

1.02 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI A208.1 - Particleboard.
 - 2. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications.
- B. ASTM International Standard Specifications:
 - 1. ASTM D1037 - Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials.
 - 2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 3. ASTM E1333 - Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber.
- C. American Woodwork Institute (AWI): Architectural Woodwork Quality Standards Illustrated.
- D. Composite Panel Association (CPA): Applicable listings.
- E. National Electrical Manufacturers Association (NEMA): LD 3 - High-Pressure Decorative Laminates.
- F. Underwriters Laboratories Inc.: UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.03 QUALITY ASSURANCE

- A. Fabricator Qualifications: Engage an experienced fabricator with not less than five (5) years experience who is certified in writing by system manufacturer, as qualified to fabricate manufacturer's system.
- B. Installer Qualifications: Engage an experienced installer with not less than five (5) years experience who is certified in writing by system manufacturer, as qualified to install manufacturer's system.
- C. Overall Standards:
 - 1. Perform Work in accordance with the latest edition of AWI "Architectural Woodwork Quality Standards Illustrated" except as modified herein.
 - 2. Counter Material and Installation: Custom Grade except as modified herein.
- D. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-Accredited Certification Body.

1.04 SUBMITTALS

- A. General: Submit Shop Drawings, Product Data, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein. Work shall not begin until Shop Drawings have been reviewed by the Architect.
 - 1. Shop Drawings: Prepare complete Shop Drawings, showing dimensions, sections, details of materials, fabrication, and installation of materials and products.
 - 2. Product Data: Submit Product Data for each type of product specified.
 - 3. Samples for Verification Purposes: Provide in the form of 8 by 10 inch Samples for each finish, color, and texture required on the Drawings.
 - 4. Qualification Data: Provide data on firms and persons as specified herein under Article "QUALITY ASSURANCE" to demonstrate capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, plus other information specified.
 - 5. Installer Certificates: Provide certificates signed by manufacturer certifying that Installers comply with requirements as specified herein under Article "QUALITY ASSURANCE".

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver all materials to the site in protective crates and wrappings clearly labeled with pertinent information to facilitate checking. Unload in areas designated by the General Contractor.
- B. Protection: Protect all materials from the weather during transit and during storage at the site. Store materials above the ground, in properly protected dry storage facilities, until ready for use. Do not deliver materials to the job site until required for installation. Take all precautions to avoid absorption of moisture by counter.
- C. Do not deliver Counter until HVAC system is operating.

1.06 PROJECT CONDITIONS

- A. Environmental Requirements: Operate HVAC system to maintain occupancy level temperature and relative humidity conditions from 24 hours prior to delivery of materials through remainder of construction period.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Plastic Laminate:

1. Brand Name Products and Manufacturers:
 - a. Formica® by Formica Corporation, 10155 Reading Road, Cincinnati, OH 45241, (513)786-3400 or (800)367-6422; www.formica.com.
 - b. Nevamar® by Nevamar™ Decorative Surfaces, One Nevamar Place, Hampton, SC 29924, (803)943-7200 or (800)638-4380; www.nevamar.com.
 - c. Pionite® by Pionite® Decorative Surfaces, A Subsidiary of Panolam Industries, Inc., One Pionite Road, Auburn, ME 04211-1014, (207)784-9111 or (800)746-6483; www.pionite.com.
 - d. Wilsonart® by Wilsonart LLC, 2400 Wilson Place, P.O. Box 6110, Temple, TX 76503-6110, (254)207-7000 or (800)433-3222; www.wilsonart.com.
2. Plastic Laminate Sheets: Surfaces shown on the Drawings as plastic laminate covered shall be finished with nominal 1/16" thick high pressure plastic laminate sheets as specified herein.
 - a. Standards and Grade: Plastic laminate sheets shall conform to NEMA Standards, General Purpose Grade 10, meeting or exceeding performance standards of NEMA Standards Publication, NEMA LD-3 - High Pressure Decorative Laminates.
3. Balanced Back Construction: Wherever possible shop apply plastic laminate under pressure to approved back-up specified herein.
 - a. All panels (except as otherwise indicated) shall have "balanced back" construction, using manufacturer approved backing sheet.
 - b. Provide self-edging surfaces.
4. Quality Assurance: All plastic laminate Work shall be performed by experienced plastic laminate skilled workers.
5. Protection: Deliver the Work to the job site wrapped and protected from abrasion and moisture.
6. Colors, Patterns, and Finishes: Refer to Drawings.

B. Particleboard:

1. Standard Particleboard: Duraflake® Particleboard as manufactured by Flakeboard, 515 River Crossing Drive, Suite 110, Fort Mill, SC 29715, (877)273-7680, www.flakeboard.com. Manufacturer with equivalent products shall be subject to review by the Architect.

- a. Particleboard shall comply with ANSI A208.1,
- b. Certification: Meeting CPA 3-08 EPPS, including the following:
 - 1) Formaldehyde Emission Requirements: ANSI A208.1, Table A and HUD 24 CFR Part 3280.308.
 - 2) Recycled Content: 100 percent pre-consumer recycled/recovered wood content.
- C. Adhesive: Provide brush-on grade application contact adhesive such as Formica® (Partner with Choice Brand Adhesives) F160 Premium Water-based Brush, Roll, and Spray Grade Contact Cement, or comparable equivalent product as recommended by the plastic laminate manufacturers specified herein, subject to review by the Architect.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine casework and other supports upon which counter will be installed. Verify adequacy of support.
- B. Coordinate with responsible entity to perform corrective Work on unsatisfactory casework or support.
- C. Commencement of Work by installer shall be considered as acceptance of substrate conditions.

3.02 PREPARATION

- A. Condition counter to occupancy level environmental conditions for minimum 72 hours prior to installation.
- B. Verify location of required cutouts and obtain templates for cutouts.

3.03 INSTALLATION

- A. Particleboard: Provide and install particleboard in compliance with recommendations of the Composite Panel Association (CPA) for the types of installations indicated and/or noted on the Drawings.
- B. Plastic Laminate: Fabricate, fit, and install plastic laminate finished surface, on Counter and vanity tops, where shown and as detailed on the Drawings, all in accordance with manufacturer's recommendations and the best practices of the trade.
- C. Counter: Fabricate and install all counter as detailed on the Drawings. Shop or mill fabricate wherever possible.
 - 1. Fabrication and Installation: The fabrication and installation of all plastic laminate materials as detailed and/or shown on the Drawings shall be performed by an Accredited Fabrication Shop in accordance with the manufacturer's printed instructions and final Shop Drawings. Sheet material shall be cut to size, seamed and detailed in accordance with approved Shop Drawings.
 - 2. Field Measure: Prior to fabrication, verify sizes by field measurement.
 - 3. Cutouts: Obtain templates and make cutouts for fixtures and appliances as indicated; drill pilot holes at corners before making cutouts. Smooth cut edges and coat with waterproof coating or adhesive.

4. Plastic Laminate Top Standards: ANSI A161.2 – Decorative Laminate Counter, Performance Standards for Fabricated High Pressure. Where joints are required, spline and glue joints and provide concealed mechanical clamping of joints.
 5. Attachments: Securely attach counter to wall as detailed on the Drawings.
- D. Sealant Joint: Provide sealant joint between backsplash and wall with sealant as specified in Section 07 90 00.

3.04 CLEAN-UP

- A. Work Required: Clean-up or repair adjacent finish Work which is soiled, marred, or damaged by the Work of this section, at Contractor's expense.
- B. Debris and Waste Materials: During progress of the Work, the premises shall be kept free of all debris and waste materials resulting from the Work of this section. During progress of the Work, upon completion of Work, and before final acceptance of the Work, remove all construction debris and rubbish from the site and dispose of legally. Upon completion and before final acceptance of the Work, all debris, rubbish, unused materials, tools, and equipment shall be removed from the site.

3.05 PROTECTION

- A. Provide temporary protection to the Work of this section from damage by other construction operations until final acceptance by Owner.

END OF SECTION

SECTION 13 34 19METAL BUILDING SYSTEMS

The requirements of the "General Conditions", the "Supplementary Conditions", and "Division 1" sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Furnish all labor, materials, equipment, and services necessary for Metal Building Systems Work indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Metal Framing Components and Members.
 - 2. Metal Wall Panels and Trim.
 - 3. Metal Roof Panels and Trim.
 - 4. Metal Building Accessories.
- B. Color Selections: Refer to the Drawings.
- C. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:
 - 1. Setting of Anchor Bolts and Leveling Plates for Steel Columns - Section 03 00 50.
 - 2. Cast-In-Place Concrete - Section 03 30 00.
 - 3. Miscellaneous Metal Work - Section 05 50 00.
 - 4. Rough Carpentry - Section 06 10 00.
 - 5. Thermal Insulation - Section 07 21 00.
 - 6. Sheet Metal Work - Section 07 60 00.
 - 7. Joint Protection - Section 07 90 00
 - 8. Hollow Metal Doors and Frames - Section 08 11 13.
 - 9. Overhead Coiling Doors - Section 08 33 23.
 - 10. Field Finish Painting - Sections 09 91 13 and 09 91 23.

1.02 APPLICABLE STANDARDS

- A. Codes and Reference Specifications: Except as otherwise specified, materials and workmanship shall conform to the following current codes and specifications as amended to date.
 - 1. All applicable Local Building Codes.

- B. American Institute of Steel Construction (AISC):
 - 1. AISC Specification for Structural Steel Buildings.
 - 2. AISC Serviceability Design Considerations for Low-Rise Buildings.
- C. American Iron and Steel Institute (AISI):
 - 1. AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
- D. American Welding Society (AWS):
 - 1. AWS D1.1 / D1.1M - Structural Welding Code - Steel.
 - 2. AWS D1.3 / D1.3M - Structural Welding Code - Sheet Steel.
- E. Association for Iron & Steel Technology (AISE):
 - 1. AISE 13 - Specifications for Design and Construction of Mill Buildings.
- F. ASTM International (ASTM):
 - 1. ASTM A 36 - Standard Specification for Carbon Structural Steel.
 - 2. ASTM A 48 - Specification for Gray Iron Castings.
 - 3. ASTM A 123 - Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 4. ASTM A 307 - Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
 - 5. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - 6. ASTM A 354 - Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners.
 - 7. ASTM A 475 - Specification for Zinc-Coated Steel Wire Strand.
 - 8. ASTM A 490 - Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.
 - 9. ASTM A 500 - Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 10. ASTM A 529 - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
 - 11. ASTM A 563 - Specification for Carbon and Alloy Steel Nuts.
 - 12. ASTM A 572 - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
 - 13. ASTM A 653 / A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

14. ASTM A 792 / A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 15. ASTM A 992 - Standard Specification for Structural Steel Shapes.
 16. ASTM A 1011 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
 17. ASTM A 1039 - Specification for Steel, Sheet, Hot Rolled, Carbon, Commercial, Structural, and High-Strength Low-Alloy, Produced by Twin-Roll Casting Process.
 18. ASTM E 96 / E 96M - Standard Test Methods for Water Vapor Transmission of Materials.
 19. ASTM E 108 - Spread-of Flame Testing: Class 1A Rating.
 20. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 21. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
 22. ASTM E 1592 - Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
 23. ASTM E1646 - Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
 24. ASTM E1680 - Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.
 25. ASTM E 2140 - Test Method for Water Penetration of Metal Roof Panel Systems by Static Water Pressure Head.
 26. ASTM F 436 - Specification for Hardened Steel Washers.
 27. ASTM F 1145 - Specification for Turnbuckles, Swaged, Welded, Forged.
 28. ASTM F 1554 - Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
- G. SJI - Steel Joist Institute.
- H. Metal Building Manufacturers Association (MBMA):
1. MBMA Metal Building Systems Manual.
- I. Underwriters Laboratories (UL):
1. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies.

1.03 SUBMITTALS

- A. General: Submit Shop Drawings and Product Data to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

B. Shop Drawings: All fabricated assemblies shall be submitted to the Architect for review.

1. Prepare completely detailed Shop Drawings showing details for cutting, fabricating, and connecting all pieces. Shop Drawings shall show anchor bolt settings, transverse cross sections, sidewall, endwall, roof framing, flashing and accessory installation details. Do not duplicate Design Drawings for use as Shop Drawings. Duplication of Design Drawings shall be grounds for rejection.
2. Shop Drawing and design analysis shall be sealed by a Registered Professional Structural Engineer in the State of the proposed Project, retained and paid by the manufacturer.
3. Provide separate Shop Drawings for erection.
4. Prepare Shop Drawings in accordance with “AISC - Detailing for Structural Steel”, latest edition, using a marking system compatible with, and referenced to, the marking system used on the Design Drawings.
5. Indicate welding by using AWS symbols, showing type, size and location of all welds. Provide auxiliary views of welds as required to clarify the welded connections.
6. Formally check all Shop Drawings before forwarding to Architect.
7. Bill of Materials: Bills of material shall be furnished and shall include item weights.
8. Preventative Maintenance Manual.
9. Submit certification verifying that the metal roof system has been tested and approved by Underwriter’s Laboratory as Class 90.
10. Submit certification verifying that the metal standing seam roof system has been tested in accordance with ASTM E 1592 test protocols.

C. Samples: Submit two (2) of each finish product specified representing actual product, color and pattern to the Architect for review and written approval.

1.04 CERTIFICATION OF WELDERS

- A. Current and valid certification qualified by a recognized, Independent Laboratory shall be furnished to the Architect for all welders working on fabrication and erection PRIOR to starting Work. All welding shall be performed by welders who have qualified by tests in accordance with AWS “Standard Qualification Procedure”, to perform the type of Work required.

1.05 QUALITY ASSURANCE

1. Fabricator Qualifications: All primary products specified in this section will be supplied by a single IAS AC 472 Accredited Manufacturer/Fabricator with minimum five (5) years’ experience.
2. Erector Qualifications: Engage an experienced Erector in material, design, and extent to that indicated for this Project and with a minimum of five (5) years of experience.

1.06 QUALITY CONTROL

- A. Testing Agency Services: Contractor may engage at his expense, a separate testing agency for information and guidance, to ascertain that all new materials are furnished, fabricated, installed, or erected in accordance with all requirements of the Contract Documents. The testing agency shall send reports of all inspections to the Architect, Owner, and the General Contractor.
- B. Defective Materials: Promptly replace all defective materials and workmanship to the satisfaction of the Architect, at no cost to the Owner.
- C. Fabricator's Experience: Structural steel fabricator shall be capable of demonstrating not less than five (5) years successful experience in steel production on project of similar size and scope.

1.07 BUILDING FRAMING DESIGN

- A. Structural design for the building structural design shall be provided by the Metal Building System manufacturer per the design criteria indicated on the Drawings.
 - 1. Auxiliary Loads: Auxiliary loads shall include dynamic loads, such as cranes and material handling systems, and will be defined in the Contract Documents.
- B. General Serviceability Limits:
 - 1. Deflection Limits shall be in accordance with the applicable provisions of the Metal Building Systems Manual (MBMA), latest edition.
 - 2. Vertical Deflections:
 - a. Roof Secondary (Purlins) - L/150.
 - b. Main Frame roof beams - L/180.
 - 3. Horizontal Deflections:
 - a. Wall Secondary (Girts) - L/90.
 - b. Main Frames - H/60.
 - 4. Vertical deflection limits apply for snow load (50-year mean-recurrence interval) plus collateral load, or the code required live load. The horizontal drift and deflections limits apply for the loads induced by a basic wind speed corresponding to a 10 year mean-recurrence interval.

1.08 DAMAGE TO MATERIALS

- A. Use care in storing, handling and erecting all materials, and support properly at all times to ensure that no piece is bent, twisted or otherwise damaged. Material damage due to the carelessness of Contractor shall be corrected at Contractor's expense, to the approval of the General Contractor, before being erected.

1.09 WARRANTY

- A. Building System Warranty
 - 1. Furnish manufacturer's standard warranty for the metal building system, excluding paint.

2. The manufacturer shall warranty the metal building system against failure due to defective material or workmanship for a period of one (1) year from date of shipment.
3. The liability under this warranty shall be limited to furnishing, but not dismantling or installing, necessary replacement material F.O.B. manufacturer's plant. In no event shall the manufacturer be liable for loss of profits, or other incidental, consequential, or special damages.

B. Standing Seam Roof Weathertightness Warranty

1. Furnish manufacturer's weathertightness warranty for a maximum of 20 years against leaks in standing seam roof panels, arising out of or caused by ordinary wear and tear under normal weather and atmospheric conditions.

C. Roof and Wall Paint Finish Warranty

1. Paint Systems:

- a. Furnish manufacturer's standard warranty for the metal panel paint system against chipping, peeling, blistering, fading in excess of 5 NBS Hunter units as set forth in ASTM-D-2244, and chalking in excess of 8 units as set forth in ASTM-D-4214.
- b. The warranty shall be for a period of 25 years from the date of shipment for silicone-polyester paint systems.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Provide the metal building systems from one to the following manufacturers.

1. NUCOR Building Systems, Indiana Plant, 305 Industrial Parkway, Waterloo, IN 46793, (260)837-7891, www.Nucorbuildingsystems.com.
2. Varco Pruden Buildings, 3200 Players Club Circle, Memphis, TN 38125, (901)748-8000, www.vp.com.
3. Butler Manufacturing, P.O. Box 419917, Kansas City, MO, 64141, (816)968-3000, www.buttermfg.com.
4. Star Building Systems, subsidiary of NCI Building Systems, 8600 South I-35, Oklahoma City, OK 73149, (800)879-7827, www.starbuildings.com.
5. American Buildings Company, Midwest Division, 2101 East Main, El Paso, IL 61738, (309)527-1500, www.americanbuildings.com.
6. A&S Building Systems, 1880 Hwy. 116, P.O. Box 53, Caryville, TN 37714, (800)274-2100 or (865)426-2141, www.a-s.com.

2.02 MATERIALS

A. Primary Framing Steel:

1. Steel for hot rolled shapes must conform to the requirements of ASTM Specifications A-36, A-572 or A-992, with a minimum yield of 36 or 50 ksi, respectively.

2. Steel for built-up sections must conform to the requirements of ASTM A-1011, A-1018, A-529, A-572 or A-36 as applicable, with minimum yield of 42, 46, 50, or 55 ksi as indicated by the design requirements.
 3. Round Tube must conform to the requirements of ASTM A-500 Grade B with minimum yield strength of 42 ksi.
 4. Square and Rectangular Tube must conform to the requirements of ASTM A-500 Grade B with a minimum yield strength of 46 ksi.
 5. Steel for Cold-Formed Endwall "C" sections must conform to the requirements of ASTM A1011 or A-1039 Grade 55, or ASTM A-653 Grade 55 with minimum yield strength of 55 ksi.
 6. X-bracing will conform to ASTM A-36 or ASTM A529 for rod and angle bracing or ASTM A-475 for cable bracing.
- B. Secondary Framing Steel:
1. Steel used to form purlins, girts and eave struts must meet the requirements of ASTM A-1011 or ASTM A-1039 Grade 55 for primed material or ASTM A-653 Grade 55 for galvanized material with a minimum yield of 55 ksi.
 2. Design Thickness - Gauge to be determined by design to meet specified loading conditions.
- C. Panels:
1. Standing Seam Panels must have:
 - a. 50 percent minimum aluminum-zinc alloy-coating and conform to ASTM A792 or ASTM A-653 with a minimum yield of 50 ksi.
 2. Through-fastened panels must have:
 - a. 50 percent minimum aluminum-zinc alloy-coating and conform to ASTM A792 or ASTM A-653 with a minimum yield of 50 ksi
 3. Panel Finish:
 - a. SP Finish: Modified Siliconized Polyester paint system with a 25-year finish warranty.
- D. Panel Fasteners:
1. For Painted Finished Roof Panels: Long Life Cast Zinc head.
 2. For Wall Panels: Coated carbon steel.
 3. Color of exposed fastener heads to match the wall and roof panel finish.
 4. Concealed Fasteners: Self-drilling type, of size required.
- E. Flashing and Trim: Match material, finish, and color of adjacent components. Provide trim at rakes, including peak and corner assemblies, high and low eaves, corners, bases, framed openings and as required or specified to provide weathertightness and a finished appearance.

F. Roof Clips:

1. All clips must have factory-applied mastic and designed so that movement between the panel and the clip does not occur.
2. Short or Tall Fixed Clips: Shall be either 3-1/2 inches (89mm) or 4-1/2 inches (114mm) in height. Used for applications where only a moderate amount of thermal expansion and contraction in the roof panel is expected.
3. Short or Tall Sliding Clips: Shall be either 3-1/2 inches (89mm) or 4-1/2 inches (114mm) in height and provide either 1-7/8 inches or 3-7/8 inches of travel for panel thermal expansion and contraction, depending on clip choice.

G. Sealant and Closures:

1. Sidelaps: Factory applied non-skinning Butyl mastic.
2. Endlaps, Eave, Ridge Assembly, and Gable Flashings: Field applied 100% solids butyl-based elastomeric tape sealant, furnished in pre-cut lengths.
3. Outside Closures Closed-cell, plastic or metal.
4. Inside Closures: Closed-cell, plastic or metal.

2.03 PRIMARY FRAMINGA. Rigid Frames: Fabricated as welded built-up "I" sections or hot-rolled sections.

1. Frame Design: Clear Span, refer to Drawings.

B. Rigid Frame Columns:

1. Tapered.

C. Rigid Frame Rafters:

1. Tapered.

D. Endwall Frames/Roof Beams: Fabricated as mill-rolled sections or built-up "I" sections depending on design requirements. Fabricate endwall columns of cold-formed "C" sections, mill-rolled sections, or built-up "I" sections depending on design requirements.E. Finish: Red Oxide Primer.F. Field Bolted Connections: All field bolted connections shall be designed and detailed utilizing ASTM A-325 or A-490 depending on design requirements.2.04 SECONDARY FRAMINGA. Purlins and Girts: Purlins and girts shall be cold-formed "Z" sections with stiffened flanges. Flange stiffeners shall be sized to comply with the requirements of the latest edition of AISI and LGSI. They shall be pre-punched at the factory to provide for field bolting to the rigid frames. They shall be simple or continuous span as required by design. Connection bolts will install through the purlin/girt webs, not purlin/girt flanges.B. Purlins (Excluding Open Web Joists): Horizontal structural members which support roof coverings.

1. Depth: To be determined by design.
 2. Maximum Length: To be determined by design.
 3. Finish: Red Oxide Primer.
- C. Girts: Horizontal structural members that support vertical panels.
1. Depth: To be determined by design.
 2. Maximum Length: To be determined by design.
 3. Finish: Red Oxide Primer.
- D. Eave Struts: Unequal flange, cold-formed "C" sections of "Z" purlins.
1. Depth: To be determined by design.
 2. Maximum Length: To be determined by design.
 3. Finish: Red Oxide Primer.
- E. Base Framing: Base members to which the base of the wall covering may be attached to the perimeter of the slab. Secured to the concrete slab with mechanical anchors.
1. Base Angle:
 - a. With flashing.
 2. Finish: Red Oxide Primer.

2.05 ROOF PANELS

- A. Roof Panel: Nucor CFR standing seam roof panel with concealed clips. Installed directly over insulation. Tested in accordance with ASTM E 1646 and E 2140 for water penetration and ASTM E 1680 for air infiltration.
1. Panel Gauge: 24.
 2. Panel Configuration: Panels shall have 3" deep trapezoidal ribs spaced 24" on center. Three minor ribs are spaced in the flat of the panel between the major ribs.
 3. Standard Finish: Smooth.
- B. Panel Clips and Fasteners:
1. Fixed panel clips shall only be used with the panel runs of less than 80'. Floating panel clips shall be used up to a 240' panel run and shall be self-centering and allow for up to 1-1/2" expansion and/or contraction of total movement from the centered position. The clip design shall insure that movement does not occur between the panel and clip.
 2. The panel clips shall have factory-applied mastic to insure a weather-tight installation.
 3. Each clip shall be attached to the joist or purlin with a minimum of two fasteners. In certain instances, three fasteners may be required. Size and type of clip and fastener quantity will be

recommended by Nucor Building Systems for the specific application. Clip fasteners and for retrofit applications are not by Nucor and must be specified by the Owner or his Agent.

4. Panel endlap fasteners shall be a No. 12 self-drilling carbon steel screw, hex washer head, 1-1/4" long. Fastener shall have a 20-year corrosion resistant coating.

2.06 WALL PANELS

- A. Panel: Nucor Reverse Classic Wall Panel consists of major ribs 1-1/4" deep spaced at 12" on center with extended purlin bearing sidelap to allow for additional sidelap support. Two minor ribs evenly spaced in the flat area between the major ribs. Panel designed for blanket insulation.

1. Panel Gauge: 26 (std.) minimum.

2.07 BLANKET WALL AND ROOF INSULATION

- A. Refer to "Section 07 21 00 - Thermal Insulation".

2.08 ACCESSORIES

- A. Roof Line Trim:

1. Trim Type: Simple Eave/Rate Trim.

- B. Purlin Extensions: Overhanging or projecting roof structure at the end of a building.

- C. Framed Openings: Used to frame doors, windows, louvers, and any other openings. Refers to the framing members and flashing which surround an opening and includes jambs, header and or sill, trim, and fasteners.

- D. Valley Gutter: Gutter used to carry off water from attached buildings or multi-gabled buildings. Standard valley gutter is 14 gauge pre-galvanized 10 foot (3048mm) sections, field welded in place (gutter liner and drainage members by others).

- E. Roof Curbs (if Required): Welded units fabricated for Metal Roof application. Minimum 18 gauge Galvalume™ coated steel, with welds cleaned and treated with protective coating compatible with the Galvalume™ substrate.

1. Top of curb to be level with ground, with 1-1/2" top flange.
2. Curb walls insulated with 1-1/2" - 3 lb. density fiberglass insulation.
3. Welded cricket on upslope side of curb to divert water.
4. Metal or plastic rib covers supplied loose for flexibility when installing curb.
5. Standard sub-frame shall be minimum 16 gauge steel.
6. All fasteners and sealants required for installation shall be furnished by Roof Curb manufacturer.

- F. Pipe Flashings: Aluminum base with EPDM boot. The base flange must bend to form a seal with surface irregularities or roof pitch.

2.09 FABRICATION

A. General:

1. Shop-fabricate all framing members for field bolted assembly. The surfaces of the bolted connections must be smooth and free from burrs or distortions.
2. Shop connections must conform to the manufacturer's standard design practices as defined in this section. Certification of welder qualifications will be furnished when required and specified in advance.
3. All framing members must carry an identifying mark.

B. Primary Framing:

1. Plates, Stiffeners and Related Members: Factory weld base plates splice plates, cap plates, and stiffeners into place on the structural members.
2. Bolt Holes and Related Machining: Shop fabricate base plates, splices and flanges to include bolt connection holes. Shop fabricated webs to include bracing holes.
3. Secondary structural connections (purlins and girts) to be ordinary bolted connections, which may include welded clips.
4. Manufacturer is responsible for all welding inspection in accordance with the manufacturer's IAS Accreditation or CAN/CSA A660 Certification.
5. Non-Destructive Testing (NDT) - NDT shall be performed and documented as required by the governing building code for this project.

C. Zee Purlins:

1. Fabricate purlins from cold-formed "Z" sections with stiffened flanges. Size flange stiffeners to comply with the requirements of the latest edition of AISI. Connection bolts will install through the webs, not the flanges.

D. Girts:

1. Girts must be simple or continuous span as required by design. Connection bolts will install through the webs, not the flanges.

E. Bracing:

1. Diagonal Bracing:
 - a. Wind bracing in the roof and/or walls need not be furnished where it can be shown that the diaphragm strength of the roof and/or wall covering is adequate to resist the applied wind or seismic forces. Diagonal bracing in the roof and sidewalls may be used to resist longitudinal loads (wind, crane, etc.) in the structure if diaphragm action cannot be used.
 - b. Diagonal bracing will be furnished to length and equipped with hillside washers and nuts at each end. It may consist of rods threaded each end or galvanized cable with suitable threaded end anchors. If load requirements so dictate, bracing may be of structural angle and/or pipe, bolted in place.

2. Special Bracing: When diagonal bracing is not permitted in the sidewall, a rigid frame type portal or fixed base column will be used. Shear walls can also be used where adequate to resist the applied wind or seismic forces.
 3. Flange Braces: The compression flange of all primary framing must be braced laterally with angles connecting to the bottoms chords of purlins or to the webs of girts so that the flange compressive stress is within allowable limits for any combination of loading.
 4. Bridging:
 - a. Laterally bridge the top and bottom chords of the open-web bar joists as required by design thereof and specified on the building erection drawings.
- F. Standing Seam Panels - General:
1. One side of the panel is configured as female, having factory applied hot-melt mastic inside the female seam. The female side will hook over the male side and when seamed creates a continuous lock, forming weathertight seam.
 2. Panels are factory notched at both ends so that field installation can commence or terminate from either end of the building. Panels cannot start at both ends of the building and work towards each other.
 3. Maximum panel length is 55 feet (16,764mm) unless otherwise noted on the Contract Documents.
 4. Endlaps:
 - a. Endlaps must have a 16 gauge backup plate and have the (8) endlap joint fasteners installed in dimpled locations in the flat with (1) endlap joint fastener installed in each trapezoid shoulder for a total of (10) fasteners at each endlap.
 - b. Apply mastic between the panels and secured with #12-14 x 1-1/4 inch (32mm) self-drilling fasteners through the panels and backup plate to form a compression joint.
 - c. "Through-the-Roof" fasteners may only be used at endlaps and eaves.

2.10 PAINING (SHOP AND FIELD)

- A. Shop prime paint and field touch-up all steel members.
- B. Before shop painting, thoroughly clean all surfaces of dirt, grease, scale, and rust.
 1. On all surfaces not in contact but inaccessible after assembling, provide one (1) paint coat before assembling.
 2. Surfaces in contact after assembling need not be painted.
 3. Provide one (1) paint coat on all finished shop fabricated pieces.
- C. After erection, clean-off all foreign material from the steel, and, if any paint is removed, repaint such areas.
- D. After all Steel Work has been erected and accepted, touch-up paint all exposed and/or abraded areas and surfaces, including field bolts and welded areas.

2.11 GALVANIZED MEMBERS

- A. Steel elements exposed to the weather and/or noted on the Drawings, shall be hot-dipped galvanized after fabrication.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Before erection proceeds, survey elevations and locations of concrete and masonry bearing surfaces and locations of anchor rods, bearing plates and other embedment's to receive structural framing, with Erector present, for compliance with requirements and metal building system manufacturer's tolerances.
- C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads equal in intensity to design loads. Remove temporary supports when permanent structural framing connections and bracing are in place, unless otherwise indicated.

3.03 INSTALLATION

- A. The erection of the building system shall be performed by a qualified erector, in accordance with the appropriate erection drawings, erection guides and/or other documents furnished by manufacturer, using proper tools, equipment and safety practices.
- B. Erection practices shall conform to "Common Industry Practices", Section 6 MBMA (LR)-Building Systems Manual.
- C. There shall be no field modifications to primary structural members except as authorized and specified by manufacturer.
- D. Install wall and roof blanket insulation per manufacturer's written installation instructions.

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

3.05 FIRE PREVENTION

- A. Precautions: When welding and/or cutting with burning torches is required, take all precautions to prevent damage to the building(s) from fire, weld spatter, dripping molten metal, smoke and fumes, or other causes arising from the operations. Provide fireproof tarpaulins or enclosures around the areas of welding or burning.

- B. Trained Personnel and Equipment: Furnish a worker trained and experienced in fire-fighting, whose sole duty shall be to prevent damage and fire at each location where welding or burning is to be done. Furnish adequate and sufficient fire-fighting equipment and extinguishers at each location.

3.06 DAMAGE TO ADJACENT MATERIALS

- A. Contractor shall be responsible for any damage to adjacent construction in place, caused by the Metal Building Systems Work. All damage shall be repaired to the satisfaction of the Architect, at no expense to the Owner.

END OF SECTION

SECTION 14 92 00PNEUMATIC TUBE SYSTEM

The requirements of the "General Conditions", the "Supplementary Conditions", and "Division 1" sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Furnish all labor, material, equipment apparatus, tools, transportation, protection, and services necessary for the proper execution and completion of the Pneumatic Tube System Work as indicated on the Drawings and specified herein. Work includes but is not necessarily limited to the following.
1. Type I and Type II Stations.
 2. Connecting Tubes.
- B. Related Sections: The following items of related Work will be provided under other sections of the Specifications:
1. Concrete Work - Section 03 30 00.
 2. Masonry Work - Section 04 20 00.
 3. Carpentry Work - Section 06 10 00.
 4. Glass, Glazing, and Aluminum Work - Section 08 41 00.
 5. Non-Structural Metal Stud Framing - Section 09 22 16.
 6. Gypsum Wallboard - Section 09 29 00.
 7. Field Painting - Section 09 91 23.
 8. Electrical - Division 26.

1.02 QUALITY ASSURANCE

- A. Installer: Installer is to be acceptable to the manufacturer of the equipment.

1.03 SUBMITTALS

- A. General: Submit Shop Drawings and Product Data to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings, and as specified herein.
- B. Shop Drawings: Prepare completely detailed Shop Drawings, showing all Work to be provided, including installation details. Include detailed plans, elevations, and details of framing members, required clearances, anchors, and accessories. Include relationship with adjacent materials.

- C. Product Data: Submit manufacturer's Product Data, and complete information describing equipment and installation instructions for type of rolling steel fire door specified herein. Include both published data and any specific data prepared for this Project.

1.04 PRODUCT DELIVERY, HANDLING AND STORAGE

- A. Delivery: Deliver all products, materials, and accessories in labeled protective packages, at location designated by the General Contractor.
- B. Storage: Store and handle in strict compliance with manufacturer's instructions and recommendations. Whenever possible, store all products and materials at the site in secure interior locations. Handle all materials in a manner that will protect materials from damage from weather, excessive temperatures and construction operations. Do not place materials directly on ground.

1.05 WARRANTY

- A. Form of Warranty: Execute a warranty, in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period specified, and any damage to other Work caused by such imperfections or for the repairing of same.
- B. Provide equipment manufacturer's standard warranty against defects, except that all terms that serve to restrict the warranty to limited components shall be deleted. The manufacturer or supplier shall provide an additional warranty covering replacement costs not fully covered by the manufacturer's standard warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURER AND MODEL

- A. Manufacturer: Pneumatic Tube System specified herein shall be as manufactured by Eagle Pneumatic, Inc., 3902 Industry Blvd., Lakeland, FL 33811, (863)644-4870 or (800)237-8261, www.eaglepneumatic.com.
- 1. Model: Type I and Type II Stations.

2.02 EQUIPMENT REQUIREMENTS

- A. Each station shall be provided with the following standard control and/or safety devices:
 - 1. Red signal light to indicate that the system is in use.
 - 2. White signal light to indicate that the carrier has arrived in the station. The white light to be automatically extinguished upon removal of the carrier from the station.
 - 3. Push button actuated timer to initiate actual carrier transmission and to determine blower "on" time. The timer to be automatically reset after each transmission.
 - 4. Electro mechanical door lock preventing access to the send/receive compartment when the station is in the process of receiving a carrier.
 - 5. Carrier stop device to automatically prevent any carrier from entering the send/receive compartment at any time the station door is open.

- 6. Local or remote audible carrier arrival signal, 24V or 110V.
- 7. Local or remote carrier arrival signal light with continuous or flashing operation, 24V or 11V.
- B. Conveying Tube: Extruded thin wall plastic having an inside diameter of 3", 4" or 6" as indicated.
- C. Identification: Provide factory installed permanent name tags for each item of equipment. Rivet name tag to equipment in accessible location near manufacturer's nameplate.
- D. Finishes (Stations): Enamel finish, platinum in color, suitable for finished installation or suitable for field painting.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Contractor shall take field dimensions and examine conditions of substrates, supports, and other conditions under which this Work is to be performed. Do not proceed with Work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. Mount and align equipment in accordance with manufacturer's printed recommendation.
- B. Tubing:
 - 1. Bends shall be of the same material and dimensions as straight tubing formed on a center line radius of 48" to be a true round section which will not interfere with the passage of a standard Eagle Pneumatic carrier. Bends shall be joined to other bends or to straight tubing with couplings of the same material as the straight tubing and of proper dimensions to provide an airtight connection. Where bends are cut in the field for offsets and/or small angle turns, the ends shall be cut square to ensure proper alignment of the adjoining piece.
 - 2. Expanded bends will be permitted where the long radius bends cannot be accommodated because of limited space or building obstructions. Expanded bends shall be short radius, designed with an expanded section to permit free travel of the carriers without binding. Expanded bends may be used for upward, downward or horizontal travel.
- C. Suspended Supports: Do not suspend hangers from roof deck unless indicated.
 - 1. Hangers shall be spaced not more than ten (10) feet on centers. Hangers shall consist of a single tube clamp of proper diameter designed to be supported by a threaded rod of not less than 3/8" diameter. Upper rod fittings appropriate to the overhead construction shall be provided.
 - 2. Structural Steel: Use beam or channel clamps with retaining clips.
- D. Field Tests: Test run all equipment and make alignment adjustments.
- E. Manufacturer's Service Representative: Provide at least 1 day of manufacturer's representatives time for startup and initial operation.
- F. Upon completion of the work, the contractor shall conduct a final inspection of same to ensure that the fixtures, equipment and piping installed by him have been made clean and placed in complete and

satisfactory working order, that all surplus materials, as well as debris occasioned by his work, have been removed from the premises and that the site is left in a presentable state.

3.03 OPERATING INSTRUCTIONS

- A. Upon completion, furnish all written information to the Owner necessary for proper operation of the door equipment, and instruct the Owner's personnel with the operating procedures and maintenance schedule.

END OF SECTION

**SECTION 210500
COMMON WORK RESULTS FOR FIRE SUPPRESSION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Above ground piping.
- B. Buried piping.
- C. Expansions - hose and braid.
- D. Mechanical couplings.
- E. Pipe hangers and supports.
- F. Pipe sleeves.

1.02 RELATED REQUIREMENTS

- A. Section 211200 - Fire-Suppression Standpipes: Standpipe design.
- B. Section 211300 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

1.03 REFERENCE STANDARDS

- A. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators 2021.
- B. ASTM A536 - Standard Specification for Ductile Iron Castings 1984 (Reapproved 2019)e1.
- C. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings 2012.
- D. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings 2017.
- E. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast 2017, with Errata (2018).
- F. AWWA C606 - Grooved and Shouldered Joints 2015.
- G. NFPA 13 - Standard for the Installation of Sprinkler Systems Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems 2019.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, and floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.
- C. Manufacturer's qualification statement.
- D. Installer's qualification statement.
- E. Project Record Documents: Record actual locations of components and tag numbering.
- F. Operation and Maintenance Data: Include installation instructions and spare parts lists.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section.
 - 1. Minimum three years experience.
- C. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.
- D. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Sprinkler-based System:
 - 1. Comply with NFPA 13.
 - 2. See Section 211300.
- B. Standpipe and Hose System:
 - 1. Comply with NFPA 14.
 - 2. See Section 211200.
- C. Welding Materials and Procedures: Comply with ASME BPVC-IX.
- D. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

2.02 BURIED PIPING

- A. Ductile Iron Pipe: AWWA C151/A21.51.
 - 1. Fittings: AWWA C110/A21.10, standard thickness.
 - 2. Joints: AWWA C111/A21.11, styrene-butadiene rubber (SBR) or vulcanized SBR gasket.
 - 3. Mechanical Couplings: Shaped composition sealing gasket, steel bolts, nuts, and washers.

2.03 ABOVE GROUND PIPING

- A. Ductile Iron Pipe: AWWA C151/A21.51.
 - 1. Joints: AWWA C111/A21.11, SBR or vulcanized styrene-butadiene rubber gasket.
 - 2. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped composition sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.04 PIPE SLEEVES

- A. Vertical Piping:
 - 1. Sleeve Length: 1 inch (25 mm) above finished floor.
 - 2. Provide sealant for watertight joint.
- B. Pipe Passing Through Below Grade Exterior Walls:
 - 1. Zinc-coated or cast-iron pipe.
 - 2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

2.05 PIPE HANGERS AND SUPPORTS

- A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm): Malleable iron, adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 2 inches (50 mm) and Over: Carbon steel, adjustable, clevis.

2.06 MECHANICAL COUPLINGS

- A. Manufacturers:
 - 1. Tyco Fire Protection Products: www.tyco-fire.com/#sle.
 - 2. Victaulic Company; FireLock Style 009H: www.victaulic.com/#sle.
- B. Rigid Mechanical Couplings for Grooved Joints:
 - 1. Dimensions and Testing: Comply with AWWA C606.
 - 2. Minimum Working Pressure: 300 psig (2065 kPa).
 - 3. Housing Material: Fabricate of ductile iron complying with ASTM A536.
 - 4. Housing Coating: Factory applied orange enamel.
 - 5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F (minus 34 degrees C) to 230 degrees F (110 degrees C).
 - 6. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.

- C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.
- B. Install standpipe piping, hangers, and supports in accordance with NFPA 14.
- C. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- D. Install piping to conserve building space, to not interfere with use of space and other work.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Pipe Hangers and Supports:
 - 1. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
 - 2. Place hangers within 12 inches (300 mm) of each horizontal elbow.
 - 3. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 - 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- H. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- I. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
- J. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
- K. Escutcheons:
 - 1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
 - 2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
 - 3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.
- L. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

3.03 CLEANING

- A. Upon completion of work, clean all parts of the installation.
- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION 210500

This page intentionally left blank

**SECTION 211200
FIRE-SUPPRESSION STANDPIPES**

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 014100 - Regulatory Requirements.
- B. Section 210500 - Common Work Results for Fire Suppression: Fire protection piping.
- C. Section 210523 - General-Duty Valves for Water-Based Fire-Suppression Piping.

1.02 REFERENCE STANDARDS

- A. FM (AG) - FM Approval Guide current edition.
- B. ITS (DIR) - Directory of Listed Products current edition.
- C. NFPA 10 - Standard for Portable Fire Extinguishers 2017, with Errata (2018).
- D. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems 2019.
- E. NFPA 1963 - Standard for Fire Hose Connections 2019.
- F. UL 405 - Standard for Safety Fire Department Connection Devices Current Edition, Including All Revisions.
- G. UL (DIR) - Online Certifications Directory Current Edition.

1.03 SUBMITTALS

- A. Product Data: Provide manufacturer's catalog sheet for equipment indicating rough-in size, finish, and accessories.
- B. Shop Drawings: Indicate supports, components, accessories, and sizes.
 - 1. Submit shop drawings and product data to Owner's insurance underwriter for approval.
 - 2. Submit proof of approval to Architect.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with NFPA 14. Maintain one copy on site.

PART 2 PRODUCTS

2.01 FIRE HOSE CABINETS

- A. Cabinet:
 - 1. Style: Surface mounted.
 - 2. Door: 12 gauge, 0.1046 inch (2.66 mm) thick steel, flush, glazed with 1/4 inch (6.35 mm) thick wired glass full panel; hinged, positive latch device.
 - 3. Finish: Prime coated.
- B. Hose Rack: Steel with polished chrome finish; swivel type with pins and water stop.
- C. Hose: 1 inch (25 mm, DN) diameter, 50 feet (15 m) long, of linen hose; mildew and rot-resistant.
- D. Nozzle: Chrome plated brass; combination fog, straight stream, and adjustable shut-off.

2.02 FIRE DEPARTMENT CONNECTIONS

- A. Type: Free standing made of corrosion resistant metal complying with UL 405.
 - 1. Inlets: Two-way, 2-1/2 inch (65 mm, DN) swivel fittings, internal threaded. Thread size and inlets according to or Authority Having Jurisdiction. Brass caps with gaskets, chains, and lugs.
 - 2. Sleeve: Brass, 18 inches (460 mm) height.
 - 3. Signage: Raised or engraved lettering 1 inch (25.4 mm) minimum indicating system type.

2.03 FIRE EXTINGUISHERS

- A. General: Comply with NFPA 10; FM (AG), ITS (DIR), and UL (DIR) listed product.
- B. Water Type: Copper container with positive displacement pump and discharge hose.
- C. Carbon Dioxide Type: Insulated handle, hose and horn discharge assembly, self-closing lever or squeeze grip operated, insulated handle.

- D. Multi-Purpose Dry Chemical Type: Cartridge operated with hose and shut-off nozzle or integral shut-off nozzle.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NFPA 14.
- C. Locate and secure cabinets plumb and level. Establish top of cabinet (inside horizontal) surface 66 inches (1675 mm) above finished floor.
- D. Connect standpipe system to water source ahead of domestic water connection.
- E. Flush entire system of foreign matter.

3.02 FIELD QUALITY CONTROL

- A. Perform field inspection and testing (Field Acceptance Test) in accordance with Section 014000.
- B. Test entire system in accordance with NFPA 14.
- C. Test shall be witnessed by Fire Marshal.

END OF SECTION 211200

**SECTION 211300
FIRE-SUPPRESSION SPRINKLER SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wet-pipe sprinkler system.
- B. Dry-pipe sprinkler system.
- C. System design, installation, and certification.
- D. Fire department connections.

1.02 REFERENCE STANDARDS

- A. NFPA 13 - Standard for the Installation of Sprinkler Systems Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. NFPA 1963 - Standard for Fire Hose Connections 2019.
- C. UL 405 - Standard for Safety Fire Department Connection Devices Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements for additional provisions.
 - 2. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.
 - 3. Sprinkler Wrenches: For each sprinkler type.

1.04 QUALITY ASSURANCE

- A. Maintain one copy of referenced design and installation standard on site.
- B. Comply with FM (AG) requirements.
- C. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.01 SPRINKLER SYSTEM

- A. Sprinkler System: Provide coverage for entire building.
- B. Occupancy: Light hazard; comply with NFPA 13.
- C. Water Supply: Determine volume and pressure from water flow test data.
- D. Provide fire department connections where indicated.
- E. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

2.02 SPRINKLERS

- A. Suspended Ceiling Type: Semi-recessed pendant type with matching push on escutcheon plate.
 - 1. Response Type: Quick.
 - 2. Coverage Type: Standard.
 - 3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- B. Exposed Area Type: Pendant type with guard.
 - 1. Response Type: Quick.
 - 2. Coverage Type: Standard.
 - 3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- C. Sidewall Type: Semi-recessed horizontal sidewall type with matching push on escutcheon plate.
 - 1. Response Type: Quick.
 - 2. Coverage Type: Extended.
 - 3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- D. Dry Sprinklers: Concealed pendant type with matching push on escutcheon plate.

1. Response Type: Quick.
 2. Coverage Type: Standard.
 3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- E. Storage Sprinklers: Pendant type with guard.
1. Response Type: Standard.
 2. Coverage Type: Standard.
 3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

2.03 PIPING SPECIALTIES

- A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
- B. Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm, accelerator, and with the following additional capabilities and features:
- C. Backflow Preventer: Reduced pressure principle valve assembly backflow preventer with drain and OS & Y gate valve on each end.
- D. Test Connections:
1. Inspector's Test Connection for Preaction Systems:
 - a. Provide test connections approximately 6 ft (2 m) above floor for each or portion of each sprinkler system equipped with an alarm device, located at the most remote part of each system.
 - b. Route test connection to an open-site drain location, excluding janitor sinks, accepting full flow without negative consequences.
 - c. Supply discharge orifice with same size as corresponding sprinkler orifice.
 - d. Limit vertical height of exterior wall penetration to 2 ft (0.61 m) above finished grade.
 2. Backflow Preventer Test Connection:
 - a. Provide downstream of the backflow prevention assembly, listed hose valves with 2.5 inch (65 mm) National Standard male hose threads with cap and chain.
 - b. Furnish one valve for each 250 gpm (16 L/s) of system demand or fraction thereof.
 - c. Provide permanent sign reading "Test Valve" in accordance with Section 210553.
- E. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.
- F. Fire Department Connections:
1. Type: Free standing made of corrosion resistant metal complying with UL 405.
 - a. Inlets: Two way, 2-1/2 inch (65 DN) swivel fittings, internal threaded. Thread size and inlets according to NFPA 1963 or Authority Having Jurisdiction. Brass caps with gaskets, chains, and lugs.
 - b. Sleeve: Brass, 18 inches (460 mm) height.
 - c. Signage: Raised or engraved lettering 1 inch (25.4 mm) minimum indicating system type.

2.04 AIR COMPRESSOR

- A. Compressor: Single-unit, electric motor driven, motor, motor starter, safety valves, check valves, air maintenance device incorporating electric pressure switch and unloader valve.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with referenced NFPA design and installation standard.
- B. Install equipment in accordance with manufacturer's instructions.
- C. Place pipe runs to minimize obstruction to other work.
- D. Place piping in concealed spaces above finished ceilings.
- E. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

- F. Flush entire piping system of foreign matter.
- G. Hydrostatically test entire system.
- H. Require test be witnessed by Fire Marshal.

END OF SECTION 211300

This page intentionally left blank

SECTION 212400
DRY-CHEMICAL FIRE-EXTINGUISHING SYSTEM

PART 2 PRODUCTS

1.01 FIRE SUPPRESSION SYSTEM

- A. Provide a pre-engineered modular type, fixed pipe, automatic dry chemical fire suppression system for the hazard including work area, plenums, exhaust ventilation pits, and associated ductwork requiring protection.
- B. System to consist of manufacturer's dry chemical storage cylinders, actuation hardware, and distribution nozzles attached to the pipe network.
- C. System to comply with NFPA 17, NFPA 33, and NFPA 34 including extinguishing agent.

1.02 CYLINDER AND VALVE ASSEMBLY

- A. Provide steel cylinder and valve assemblies of the type and size required by the manufacturer for dry chemical storage.
- B. Specialties to consist of valves and pressure gauges, including reliable and safe means of minimizing accidental discharge.
- C. Furnish pressurized assembly with the capability of being stored and operated at the following temperature ranges:
- D. Provide listed bracketing for the mounting of the cylinder securely to the intended mounting surface.
- E. Furnish manufacturer's high-pressure nitrogen tubing when control system is mounted to a dry cylinder and in all cases where actuation delay is employed.

1.03 MANUAL RELEASE STATION

- A. Provide as a means of manually actuating the system from a remote location.
- B. Surface housing fitted with un-tensioned pull-to-trip that locks in position after allowing the control system to activate the cylinder and valve assembly, for mounting on electrical outlet box; addressable using manufacturer's standard monitor module.
- C. Functions:
 - 1. Activate all audible and visual alarms.
 - 2. Override any abort station or time delay function.
 - 3. Activate all release and shutdown functions normally triggered by detectors or alarm system.
- D. Identification:
 - 1. Provide engraved label for each manual release station indicating area protected and that actuation will cause discharge of fire extinguishing agent.
 - 2. Provide manufacturer's label directly on faceplate.

1.04 CONTROL EQUIPMENT

- A. Provide control equipment capable of automatic and manual discharge of the dry chemical agent from all extinguishing valve assemblies, including automatic shutdown of the heat source or fuel and electrical power to all protected areas upon system activation.
- B. Furnish fully enclosed, integral control head and actuator for each cylinder valve assembly without exposed means for actuation.
 - 1. Control Head: Equip with micro-switch contacts for audible alarm and equipment shutdown.
- C. All cylinders protecting one hazard area must be connected for simultaneous discharge by all methods of alarm actuation.
- D. Activate control head automatically by electrical and mechanical means.
 - 1. Provide listed, rate-compensated thermostat fire detectors complying with NFPA 17, with rating suitable to their expected exposure temperature, capable of detecting and indicating heat, flame, smoke, combustible vapors, or an abnormal condition in the hazard that is likely to produce a fire.
 - 2. Electrical Activation:
 - a. Activate electric solenoid by tested and listed system control panel.
 - b. Provide supervision for all detection and releasing circuits.

- c. Furnish listed, rate-compensated thermostat fire detectors complying with NFPA 17, with rating suitable to their expected exposure temperature, capable of detecting and indicating heat, flame, smoke, combustible vapors, or an abnormal condition in the hazard that is likely to produce a fire.
 - d. Provide secondary reserve power supply in accordance with NFPA 17.
- 3. Mechanical Activation:
 - a. Activate system control head by manufacturer supplied fire detectors incorporating mechanical thermo-bulb link systems requiring no outside power source for operation.
 - b. Provide thermo-bulb links with rating suitable to their expected exposure temperature.

1.05 DISTRIBUTION SYSTEM

- A. Flow Restrictors: Designed and supplied by the extinguishing system manufacturer to restrict flow of dry chemical through the in-line distribution piping to ensure the appropriate quantity of agent is delivered to each nozzle in the distribution system.

1.06 PIPE AND PIPING SPECIALTIES

- A. Steel Pipe: ASTM A53/A53M or ASTM A106/A106M Schedule 40, or ASTM A135/A135M Schedule 10, hot dipped galvanized.
 - 1. Fittings: ASME B16.3 malleable iron class 300 for sizes 2 inch (50 mm) and smaller, or ASTM A234/A234M, wrought steel welding type fittings.
 - 2. Joints: Threaded, AWS D1.1/D1.1M welded, or grooved and shouldered pipe end couplings.
- B. Pipe Hangers: ASME B31.1, listed, split clamp up to 2-1/2 inch (60 mm) size, riser clamps over 2-1/2 inch (60 mm) size, adequate to offset discharge thrust.
- C. Escutcheons: Chrome plated pressed or stamped brass, one-piece or split pattern, minimum 2 inches (50 mm) larger than opening.
- D. Gauges:
 - 1. ASME B40.100, UL 393, or UL 404 3-1/2 inch diameter (90 mm diameter) cast aluminum case, phosphor bronze bourdon tube, rotary brass movement, brass socket, front re-calibration adjustment, black figures on white background, 1 percent mid-scale accuracy, scale calibrated in psi.

1.07 MISCELLANEOUS EQUIPMENT

- A. Alarm Bells: 24 volts, with supervision of circuit wiring, of modular design, red baked enamel finish, with minimum sound level of 84 dba at 10 feet (3 m), for mounting on 4 inch (100 mm) electrical outlet box.
- B. Alarm Horns: 24 volts, with supervision of circuit wiring, with minimum sound level of 90 dba at 10 feet (3 m), for mounting on 4 inch (100 mm) electrical outlet box.
- C. Strobe Beacon: Manufacturer's standard design, 24 volts, with system identification on strobe lens.

END OF SECTION 212400

SECTION 220523
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 2 PRODUCTS

1.01 APPLICATIONS

- A. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).
- B. Provide the following valves for the applications if not indicated on drawings:
 - 1. Shutoff: Ball, butterfly, gate or plug.
 - 2. Dead-End: Single-flange butterfly (lug) type.
 - 3. Throttling: Provide globe, angle, ball, or butterfly.
- C. Substitutions of valves with higher CWP classes or WSP ratings for same valve types are permitted when specified CWP ratings or WSP classes are not available.
- D. Low Pressure, Compressed Air Valves 150 psi (1,035 kPa) or Less:
 - 1. 2 inch (50 mm, DN) and Smaller:
 - a. Ball: One piece, full port, brass with brass trim.
 - 2. 2-1/2 inch (65 mm, DN) and Larger:
 - a. Iron, 2-1/2 inch (65 mm, DN) to 4 inch (100 mm, DN): Provide with threaded ends.
- E. Domestic, Hot and Cold Water Valves:
 - 1. 2 inch (50 mm, DN) and Smaller:
 - a. Bronze and Brass: Provide with solder-joint ends.
 - b. Ball: One piece, full port, brass with brass trim.
 - 2. 2-1/2 inch (65 mm, DN) and Larger:
 - a. Iron, 2-1/2 inch (65 mm, DN) to 4 inch (100 mm, DN): Provide with threaded ends.

1.02 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
- D. Valve-End Connections:
 - 1. Threaded End Valves: ASME B1.20.1.
 - 2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
 - 3. Pipe Flanges and Flanged Fittings 1/2 inch (15 mm, DN) through 24 inch (600 mm, DN): ASME B16.5.
 - 4. Solder Joint Connections: ASME B16.18.
 - 5. Grooved End Connections: AWWA C606.
- E. General ASME Compliance:
 - 1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
 - 2. Solder-joint Connections: ASME B16.18.
 - 3. Building Services Piping Valves: ASME B31.9.
- F. Potable Water Use:
 - 1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
 - 2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.

1.03 BRASS, BALL VALVES

- A. One Piece, Full Port with Brass Trim and Threaded or Soldered Connections:
 - 1. Comply with MSS SP-110.
 - 2. CWP Rating: 200 psi (1,379 kPa).
 - 3. Body: Forged brass.
 - 4. Seats: PTFE.
 - 5. Stem: Brass.
 - 6. Ball: Chrome-plated brass.
 - 7. Operator: Handle.

1.04 BRONZE, BALL VALVES

- A. General:
 - 1. Fabricate from dezincification resistant material.
 - 2. Copper alloys containing more than 15 percent zinc are not permitted.
- B. One Piece, Reduced Port with Bronze Trim:
 - 1. Comply with MSS SP-110.
 - 2. WSP Rating: 400 psi (2,760 kPa).
 - 3. CWP Rating: 600 psi (4,140 kPa).
 - 4. Body: Bronze.
 - 5. End Connections: Pipe thread.
 - 6. Seats: PTFE.

1.05 IRON, BALL VALVES

- A. Class 125, Full Port, Stainless Steel Trim:
 - 1. Comply with MSS SP-72.
 - 2. CWP Rating: 200 psi (1,380 kPa).
 - 3. Body: ASTM A536 Grade 65-45-12, ductile iron.
 - 4. End Connections: Flanged.
 - 5. Seats: PTFE.
 - 6. Operator: Lever with locking handle.

PART 3 EXECUTION

2.01 INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

END OF SECTION 220523

SECTION 220553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 2 PRODUCTS

1.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

- A. Pipe Markers: 3/4 inch (20 mm) diameter and higher.

1.02 PIPE MARKERS

- A. Comply with ASME A13.1.
- B. Flexible Marker: Factory fabricated, semi-rigid, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid conveyed.
- C. Flexible Tape Marker: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- D. Identification Scheme, ASME A13.1:
 - 1. Primary: External Pipe Diameter, Uninsulated or Insulated.
 - 2. Secondary: Color scheme per fluid service.
 - a. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background.

PART 3 EXECUTION

2.01 PREPARATION

- A. Degrease and clean surfaces to receive identification products.

2.02 INSTALLATION

- A. Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags in clear view and align with axis of piping

END OF SECTION 220553

This page intentionally left blank

**SECTION 220719
PLUMBING PIPING INSULATION**

PART 2 PRODUCTS

1.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

PART 3 EXECUTION

2.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

2.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.
- C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- D. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 078400.
- E. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with canvas jacket sized for finish painting.
- F. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.
- G. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil (0.025 mm) thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

END OF SECTION 220719

This page intentionally left blank

**SECTION 221005
PLUMBING PIPING**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems 2015.
- B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300 2016.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2018.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2018.
- E. ASME B31.1 - Power Piping 2020.
- F. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers 2019.
- G. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators 2021.
- H. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2020.
- I. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings 2021.
- J. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- K. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service 2019.
- L. ASTM B32 - Standard Specification for Solder Metal 2020.
- M. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes 2020.
- N. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2020.
- O. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric) 2020.
- P. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube 2016.
- Q. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings 2016.
- R. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings 2020a.
- S. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems 2020.
- T. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings 2020.
- U. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets 2020.
- V. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings 2016.
- W. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- X. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems 2010.
- Y. AWWA C651 - Disinfecting Water Mains 2014.
- Z. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018.
- AA. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010.
- BB. NSF 61 - Drinking Water System Components - Health Effects 2020.
- CC. NSF 372 - Drinking Water System Components - Lead Content 2020.

DD. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.03 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- B. Plenum-Installed Acid Waste Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

2.02 SANITARY WASTE PIPING, BURIED BEYOND 5 FEET (1500 MM) OF BUILDING

- A. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.04 SANITARY WASTE PIPING, ABOVE GRADE

- A. Cast Iron Pipe: ASTM A74, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

2.05 DOMESTIC WATER PIPING, BURIED BEYOND 5 FEET (1500 MM) OF BUILDING

- A. Copper Pipe: ASTM B42, hard drawn.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.

2.06 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. Copper Pipe: ASTM B42, hard drawn.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.

2.07 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Joints: ASTM B32, alloy Sn95 solder.

2.08 STORM DRAINAGE PIPING, BURIED BEYOND 5 FEET (1500 MM) OF BUILDING

- A. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.09 STORM DRAINAGE PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.10 PROPANE GAS PIPING, BURIED BEYOND 5 FEET (1500 MM) OF BUILDING

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 - 1. Fittings: ASTM A234/A234M, wrought steel welding type, with AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil (0.25 mm) polyethylene tape.
 - 2. Joints: ASME B31.1, welded.

2.11 NATURAL GAS PIPING, BURIED BEYOND 5 FEET (1500 MM) OF BUILDING

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 - 1. Fittings: ASTM A234/A234M, wrought steel welding type, with AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil (0.25 mm) polyethylene tape.
 - 2. Joints: ASME B31.1, welded.

2.12 NATURAL GAS PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 - 1. Fittings: ASTM A234/A234M, wrought steel welding type.
 - 2. Joints: ASME B31.1, welded.
 - 3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil (0.25 mm) polyethylene tape.

2.13 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
 - 2. Joints: Threaded or welded to ASME B31.1.

2.14 PIPE FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 inch (80 mm, DN) and Under:
 - 1. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Sizes Over 1 inch (25 mm, DN):
 - 1. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

2.15 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
 - 3. Trapeze Hangers: Welded steel channel frames attached to structure.
 - 4. Vertical Pipe Support: Steel riser clamp.
 - 5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.
 - 6. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
 - a. Bases: High-density polypropylene.
 - b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 - c. Steel Components: Stainless steel or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
 - d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion-resistant material.
 - e. Height: Provide minimum clearance of 6 inches (150 mm) under pipe to top of roofing.
- B. Plumbing Piping - Drain, Waste, and Vent:
 - 1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Malleable iron, adjustable swivel, split ring.
 - 2. Hangers for Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.
 - 3. Wall Support for Pipe Sizes to 3 inch (80 mm, DN): Cast iron hook.

4. Wall Support for Pipe Sizes 4 inch (100 mm, DN) and Over: Welded steel bracket and wrought steel clamp.
- C. Plumbing Piping - Water:
1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Malleable iron, adjustable swivel, split ring.
 2. Hangers for Cold Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.
 3. Hangers for Hot Pipe Sizes 2 to 4 inch (50 to 100 mm, DN): Carbon steel, adjustable, clevis.

2.16 PIPE SLEEVE-SEAL SYSTEMS

- A. Modular Mechanical Seals:
1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
 2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
 3. Size and select seal component materials in accordance to service requirements.
 4. Glass reinforced plastic pressure end plates.

2.17 BALL VALVES

- A. Construction, 4 inch (100 mm, DN) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

2.18 BALANCING VALVES

- A. Construction: Class 125, brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
- B. Calibration: Control flow within five percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).

2.19 PRESSURE RELIEF VALVES

- A. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

2.20 PRESSURE-TEMPERATURE VALVES

- A. ANSI Z21.22, AGA certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F (98.9 degrees C), capacity ASME BPVC-IV certified and labelled.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- C. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- D. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- E. Pipe Sleeve-Seal Systems:
 1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
 2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.

3. Locate piping in center of sleeve or penetration.
4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
5. Tighten bolting for a watertight seal.
6. Install in accordance with manufacturer's recommendations.

3.03 FIELD TESTS AND INSPECTIONS

- A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction. In the absence of specific test and inspection procedures proceed as indicated below.
- B. Domestic Water Systems:
 1. Perform hydrostatic testing for leakage prior to system disinfection.
 2. Test Preparation: Close each fixture valve or disconnect and cap each connected fixture.
 3. General:
 - a. Fill the system with water and raise static head to 10 psi (345 kPa) above service pressure. Minimum static head of 50 to 150 psi (345 to 1,034 kPa). As an exception, certain codes allow a maximum static pressure of 80 psi (551.6 kPa).
- C. Gas Distribution Systems:
 1. Test Preparation: Close each appliance valve or disconnect and cap each connected appliance.
 2. General Systems:
 - a. Inject a minimum of 10 psi (68.9 kPa) of compressed air into the piping system for a duration of 15 minutes and verify with a gauge that no perceptible pressure drop is measured.
 - b. Ensure test pressure gauge has a range of twice the specific pressure rate selected with an accuracy of 1/10 of 1 pound (0.45 kg).
- D. Test Results: Document and certify successful results, otherwise repair, document, and retest.

3.04 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed, and clean.
- B. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.05 SERVICE CONNECTIONS

- A. Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.
 1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.

3.06 SCHEDULES

- A. Pipe Hanger Spacing:
 1. Metal Piping:
 - a. Pipe Size: 1/2 inch (15 mm, DN) to 1-1/4 inch (32 mm, DN):
 - 1) Maximum Hanger Spacing: 6.5 ft (2 m).

- 2) Hanger Rod Diameter: 3/8 inches (9 mm).
 - b. Pipe Size: 1-1/2 inch (40 mm, DN) to 2 inch (50 mm, DN):
 - 1) Maximum Hanger Spacing: 10 ft (3 m).
 - 2) Hanger Rod Diameter: 3/8 inch (9 mm).
 - c. Pipe Size: 2-1/2 inch (65 mm, DN) to 3 inch (80 mm, DN):
 - 1) Maximum Hanger Spacing: 10 ft (3 m).
 - 2) Hanger Rod Diameter: 1/2 inch (13 mm).
 - d. Pipe Size: 4 inch (100 mm, DN) to 6 inch (150 mm, DN):
 - 1) Maximum Hanger Spacing: 10 ft (3 m).
 - 2) Hanger Rod Diameter: 5/8 inch (15 mm).
- 2. Plastic Piping:
 - a. All Sizes:
 - 1) Maximum Hanger Spacing: 6 ft (1.8 m).
 - 2) Hanger Rod Diameter: 3/8 inch (9 mm).

END OF SECTION 221005

**SECTION 221006
PLUMBING PIPING SPECIALTIES**

PART 2 PRODUCTS

1.01 GENERAL REQUIREMENTS

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

1.02 CLEANOUTS

- A. Manufacturers:
1. Jay R. Smith Manufacturing Company: www.jayrsmith.com/#sle.
 2. Josam Company: www.josam.com/#sle.
 3. MIFAB, Inc: www.mifab.com/#sle.
 4. Zurn Industries, LLC: www.zurn.com/#sle.
- B. Cleanouts at Exterior Surfaced Areas COTG:
1. Round cast nickel bronze access frame and non-skid cover.
- C. Cleanouts at Exterior Unsurfaced Areas (CO-2):
1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.
- D. Cleanouts at Interior Finished Floor Areas CO:
1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.
- E. Cleanouts at Interior Finished Wall Areas WCO:
1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.
- F. Cleanouts at Interior Unfinished Accessible Areas (CO-5): Calked or threaded type.
Provide bolted stack cleanouts on vertical rainwater leaders.

1.03 HOSE BIBBS

- A. Manufacturers:
1. Jay R. Smith Manufacturing Company: www.jayrsmith.com/#sle.
 2. T&S BRASS, WOODFORD.
- B. Interior Hose Bibbs:
1. Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome plated where exposed with handwheel, integral vacuum breaker in compliance with ASSE 1011.

1.04 HYDRANTS

- A. Manufacturers:
1. Jay R. Smith Manufacturing Company: www.jayrsmith.com/#sle.
 2. T&S BRASS, WOODFORD.
- B. Wall Hydrants:
1. ASSE 1019; freeze resistant, self-draining type with chrome plated wall plate hose thread spout, handwheel, and integral vacuum breaker.

1.05 REFRIGERATOR VALVE AND RECESSED BOX

- A. Box Manufacturers:
1. IPS Corporation/Water-Tite: www.ipscorp.com/#sle.
 2. Oatey Supply Chain Services, Inc: www.oatey.com/#sle.
 3. GUY GRAY.

1.06 BACKFLOW PREVENTERS

- A. Manufacturers:
1. MIFAB, Inc: www.mifab.com/#sle.
 2. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com/#sle.
 3. Zurn Industries, LLC; 375XL: www.zurn.com/#sle.
- B. Reduced Pressure Backflow Preventer Assembly:

1. ASSE 1013; cast bronze body and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure, and non-threaded vent outlet.
 2. Size: 3/4 to 2 inch (20 to 50 mm, DN) assembly with threaded gate valves.
- C. Reduced Pressure Backflow Preventer Assembly:
1. ASSE 1013 and NSF 61 compliant reinforced-nylon body and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure, integral male test fittings, and non-threaded vent outlet.
 2. Size: 3/4 to 2 inch (20 to 50 mm, DN) assembly with threaded gate valves.
 3. Accessories: Provide air gap fitting, lead-free Y-strainer, and test cocks.
- D. Reduced Pressure Backflow Preventer Assembly:
1. ASSE 1013 and NSF 61 compliant stainless steel body assembly with corrosion resistant internal parts, stainless steel springs, diaphragm type differential pressure relief valve located between check valves, third check valve that opens under back pressure in case of diaphragm failure, and non-threaded vent outlet.
 2. Configured to protect against backsiphonage and backpressure into potable water supply.
 3. Size: 2-1/2 to 10 inch (65 to 250 mm, DN) assembly with flanged OS&Y gate valves.
 4. Accessories: Provide flanged Y-strainer, pressure monitor, and test cock.

1.07 WATER HAMMER ARRESTORS

- A. Manufacturers:
1. Cash Acme, a brand of Reliance Worldwide Corporation: www.cashacme.com/#sle.
 2. Jay R. Smith Manufacturing Company: www.jayrsmith.com/#sle.
 3. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com/#sle.
 4. Zurn Industries, LLC: www.zurn.com/#sle.
- B. Water Hammer Arrestors:
1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F (minus 73 to 149 degrees C) and maximum 250 psi (1700 kPa) working pressure.

1.08 SANITARY WASTE INTERCEPTORS

- A. Oil Interceptors:
1. Construction:
 - a. Material: POLYPROPYLENE.
 - b. Rough-in: On floor.
 - c. Cover: Steel, epoxy coated, non-skid with gasket, securing handle, and enzyme injection port, recessed for floor finish.
 2. Manufacturers:
 - a. SCHIER.

1.09 MIXING VALVES

- A. Thermostatic Mixing Valves:
1. Valve: Chrome plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.

1.10 FLOOR DRAIN TRAP SEALS

- A. Manufacturers:
1. MIFAB, Inc: www.mifab.com/#sle.
 2. SURE SEAL.
- B. Description: Push-fit EPDM or silicone fitting with a one-way membrane.

PART 3 EXECUTION

2.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
- F. Pipe relief from backflow preventer to nearest drain.
- G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks, washing machine outlets, or water closets.
- H. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 3/4 inch (20 mm) minimum, and minimum 18 inches (450 mm) long.

END OF SECTION 221006

This page intentionally left blank

**SECTION 221500
GENERAL-SERVICE COMPRESSED-AIR SYSTEMS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300 2016.
- B. ASME B31.1 - Power Piping 2020.
- C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2020.
- D. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service 2019.

1.02 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for reciprocating air compressors.

PART 2 PRODUCTS

2.01 PIPE AND PIPE FITTINGS

- A. Steel Pipe: ASTM A53/A53M, Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
 - 2. Joints: Threaded or welded to ASME B31.1.

2.02 AIR OUTLETS

- A. Quick Connector: 3/8 inch (10 mm) brass, snap-on connector with self closing valve, Style A.

2.03 AIR COMPRESSORS

- A. Manufacturers:
 - 1. Ingersoll Rand Compressed Air Solutions: www.ingersollrandproducts.com/#sle.

2.04 AIR DRYERS

- A. Manufacturers:
 - 1. Ingersoll Rand Compressed Air Solutions: www.ingersollrandproducts.com/#sle.
- B. Type: Self-contained mechanical refrigeration type complete with heat exchanger, refrigeration compressor, automatic controls, moisture removal trap, internal wiring and piping, and full refrigerant charge.
- C. Air Connections: Inlet and outlet connections at same level, factory insulated.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install equipment in accordance with manufacturer's instructions.

3.02 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Compressed Air Piping Leak Test: Prior to initial operation, clean and test compressed air piping in accordance with ASME B31.1.
- C. Repair or replace compressed air piping as required to eliminate leaks, and retest to demonstrate compliance.
- D. Cap and seal ends of piping when not connected to mechanical equipment.

END OF SECTION 221500

This page intentionally left blank

**SECTION 223000
PLUMBING EQUIPMENT**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. UL 174 - Standard for Household Electric Storage Tank Water Heaters Current Edition, Including All Revisions.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittals procedures.
- B. Product Data:
 - 1. Provide electrical characteristics and connection requirements.
- C. Shop Drawings:
- D. Project Record Documents: Record actual locations of components.
- E. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Certifications:
 - 1. Water Heaters: NSF approved.
 - 2. Electric Water Heaters: UL listed and labeled to UL 174.
 - 3. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.04 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer warranty for domestic water heaters.

PART 2 PRODUCTS

2.01 WATER HEATERS

- A. Commercial Electric:
 - 1. Manufacturers:
 - a. Bradford White Corporation: www.bradfordwhite.com/#sle.
 - b. A.O. SMITH: www.hotwater.com.
 - 2. Type: Factory-assembled and wired, electric, vertical storage.
 - 3. Performance:
 - 4. Electrical Characteristics:
 - 5. Heating Elements: Flange-mounted immersion elements; individual elements sheathed with Incoloy corrosion-resistant metal alloy, rated less than 75 W/sq in (11.6 W/sq m).

2.02 ELECTRICAL WORK

- A. Provide electrical motor driven equipment specified complete with motors, motor starters, controls, and wiring.
- B. Electrical characteristics to be as specified or indicated.
- C. Furnish motor starters complete with thermal overload protection and other appurtenances necessary for the motor control specified.
- D. Supply manual or automatic control and protective or signal devices required for the operation specified, and any control wiring required for controls and devices not shown.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.
- B. Coordinate with plumbing piping and related fuel piping work to achieve operating system.

END OF SECTION 223000

SECTION 224000 PLUMBING FIXTURES

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration. 2013.
- C. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use 1997 (Reaffirmed 2017).
- D. ASME A112.18.1 - Plumbing Supply Fittings 2018, with Errata.
- E. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures 2011 (Reaffirmed 2017).
- F. ASME A112.19.1 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures 2018.
- G. ASME A112.19.2 - Ceramic Plumbing Fixtures 2018.
- H. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks 2017.
- I. ASSE 1014 - Performance Requirements for Backflow Prevention Devices for Hand-Held Showers 2005.
- J. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices 2015.
- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- L. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.
- M. NSF 61 - Drinking Water System Components - Health Effects 2020.
- N. NSF 372 - Drinking Water System Components - Lead Content 2020.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.03 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 FLUSH VALVE WATER CLOSETS

- A. Water Closets:
 - 1. Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.
 - 2. Flush Valve: Exposed (top spud).
 - 3. Flush Operation: Sensor operated.
 - 4. Handle Height: 44 inches (1117 mm) or less.
 - 5. Trapway Outlet: 4 inch (100 mm, DN).
 - 6. Color: White.
 - 7. Manufacturers:
 - a. Kohler Company: www.kohler.com/#sle.
- B. Flush Valves:
 - 1. Valve Supply Size: 1 inch (25 mm, DN).

2. Valve Outlet Size: 1-1/2 inches (40 mm, DN).
3. Manufacturers:
 - a. Zurn Industries, LLC; ZEMS Series: www.zurn.com/#sle.
4. Sensor-Operated:
 - a. Type: ASME A112.19.5; chloramine-resistant clog-resistant dual-seat diaphragm valve complete with vacuum breaker stops and accessories.
 - b. Mechanism: Solenoid-operated piston or electronic motor-actuated operator with low-voltage powered infrared sensor, and mechanical override or override push button.
 - c. Supplied Volume Capacity: 1.2 gal (4.5 L) per flush.
- C. Toilet Seats:
 1. Manufacturers:
 - a. Bemis Manufacturing Company: www.bemismfg.com/#sle.
 - b. Church Seat Company: www.churchseats.com/#sle.
 - c. Olsonite: www.olsonite.com/#sle.
 - d. Zurn Industries, LLC: www.zurn.com/#sle.
 2. Plastic: Solid, white finish, elongated shape, open front, slow-closing hinged seat cover, extended back complete with self-sustaining hinges, and brass bolts with covers.
 3. Plastic: Black finish, open front, extended back, self-sustaining hinge, brass bolts, with cover.
- D. Water Closet Carriers:
 1. Manufacturers:
 - a. Jay R. Smith MFG. Co: www.jrsmith.com/#sle.
 - b. JOSAM Company: www.josam.com/#sle.
 - c. Zurn Industries, LLC; Z1201-N: www.zurn.com/#sle.
 2. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

2.03 WALL HUNG URINALS

- A. Manufacturers:
 1. Kohler Company: www.kohler.com/#sle.
- B. Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.
 1. Consumption Volume: 1.0 gal (3.7 L) per flush, maximum.
 2. Flush Style: Washout.
 3. Flush Valve: Exposed (top spud).
 4. Flush Operation: Sensor operated.
 5. Trapway Outlet: Integral.
 6. Removable stainless steel strainer.
- C. Flush Valves:
 1. Manufacturers:
 2. Sensor-Operated:
 - a. Type: ASME A112.19.5; chloramine-resistant, clog-resistant dual-seat diaphragm valve with vacuum breaker stops and accessories.
 - b. Mechanism: Solenoid-operated piston or electronic motor-actuated operator with low-voltage powered infrared sensor, and mechanical override or override push button.
 - c. Supplied Volume Capacity: 1.1 gal (4.2 L) per flush.
- D. Urinal Carriers:
 1. Manufacturers:
 - a. Jay R. Smith MFG. Co: www.jrsmith.com/#sle.
 - b. JOSAM Company: www.josam.com/#sle.
 2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.04 LAVATORIES

- A. Manufacturers:
 1. Kohler Company: www.kohler.com/#sle.

- B. Wall-Hung Basin:
 - 1. Porcelain-Enamelled Cast Iron: ASME A112.19.1; white, rectangular basin with splash lip, front overflow, soap depression, and hanger. Size as indicated on drawings with 4 inch (100 mm) centerset spacing.
 - 2. Carrier:
 - a. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.
 - b. Manufacturers:
 - 1) Jay R. Smith MFG. Co: www.jrsmith.com/#sle.
 - 2) JOSAM Company: www.josam.com/#sle.
 - 3) Zurn Industries, LLC; Z1231: www.zurn.com/#sle.
- C. Supply Faucet:
 - 1. Manufacturers:
 - a. MOEN.
 - 2. Supply Faucet: ASME A112.18.1; chrome plated combination supply fitting with pop-up waste, water economy aerator with maximum flow of 2.2 gpm (8.3 Lpm), indexed handles.
- D. Sensor Operated Faucet:
 - 1. Cast brass, chrome plated, deck mounted with sensor located on neck of spout.
 - 2. Spout Style: Standard.
 - 3. Power Supply:
 - a. Wired: 6 VDC, field-wired into dedicated or common power supply.
 - b. Wireless:
 - 1) Battery: Replaceable alkaline or lithium type with 200,000 cycles, minimum.
 - 2) Light Cell: Photovoltaic or infra-red cell that transforms both sunlight and artificial light into electrical energy for use and battery charging.
 - 3) Low Battery Warning: Provide red or yellow colored indicator to light periodically at 30 days of remaining capacity and continuously 2 weeks prior to get fully discharged.
 - 4. Mixing Valve: External lever operated.
 - 5. Water Supply: 3/8 inch (9 mm) compression connections.
 - 6. Aerator: Vandal resistant, 0.5 gpm (1.89 Lpm), laminar flow device.
 - 7. Finish: Polished chrome.
 - 8. Lead Content: Extra low; maximum 0.25 percent by weighed average.
- E. Thermostatic Mixing Valve:
 - 1. ASSE 1070 listed with combination stop, strainer, and check valves, and flexible stainless steel connectors.
- F. Lavatory Carrier:
 - 1. Manufacturers:
 - a. Jay R. Smith MFG. Co: www.jrsmith.com/#sle.
 - b. JOSAM Company: www.josam.com/#sle.
 - c. Zurn Industries, LLC; Z1231: www.zurn.com/#sle.
 - 2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.

2.05 WALL-HUNG, SOLID SURFACE, MULTI-STATION LAVATORY UNITS

- A. Manufacturers:
 - 1. Just Manufacturing.
- B. Description: Rectilinear, level-surface deck, seamless and integral elongated basin, with stainless steel enclosed pedestal cabinet.
- C. Deck and Bowl Material: Fabricate from molded engineered stone material consisting of natural quartz, granite, and other minerals in a matrix of thermoset acrylic modified bio-based polyester resin and meeting requirements of IAPMO Z124.
- D. Surface Burning Characteristics: Smoke developed index less than 450, and flame spread index less than 25, Class A, when tested in accordance with ASTM E84.
- E. Number of Wash Stations: Two.

- F. Unit Length: 48 inches (1220 mm).
- G. Soap Dispenser:
- H. Color: Just Manufacturing.
- I. Faucet Drilling: 4 inch (100 mm) centerset drilling.
- J. Sensor-Operated Faucets:
 - 1. High profile metering faucet with infrared and external temperature control.
 - 2. Vandal-resistant meeting requirements of ASME A112.18.1 and ADA Standards compliant.
 - 3. Body: Polished chrome plated commercial solid cast brass, with 4 inch (102 mm) centerset mounting with anti-rotation trim plate.
 - 4. Tempered Water Supply: ADA Standards compliant lever on faucet body.
 - 5. Aerator: Flow rate of 0.5 gpm (1.8 Lpm) at 20 to 80 psi (138 to 552 kPa) operating range.
 - 6. Sensor Module: Water conserving, vandal-resistant adjustable sensor unit with timing turn-off delay and stationary object automatic timed cutoff, with battery diagnostic light, serviceable from above deck.
 - 7. Power Supply: 6 VDC lithium battery and single 115 VAC plug-in adapter.
 - 8. Thermostatic Mixing Valve:
 - a. ASSE 1070 listed with combination stop, strainer, and check valves, and flexible stainless steel connectors.
- K. Access Panel: Stainless steel.
- L. Support Frame: Wall mounted, heavy gauge, stainless steel.
- M. Manufacturers:
 - 1. Just Manufacturing.

2.06 SINKS

- A. Manufacturers:
 - 1. Elkay.
- B. Kitchen Faucets:
 - 1. Manufacturers:
 - a. MOEN.
 - 2. Two Handle Faucet:
 - a. Type: Deck-mount, lever operated faucet with mounting plate.
 - b. Spray Type: Full stream spray at 1.75 gpm (6.62 Lpm), maximum.
 - c. ASME A112.18.1, ADA Standards, and NSF 61 compliant assembly.
 - d. Materials: Stainless steel disc valve on brass body with polished chrome finish.

2.07 UNDER-LAVATORY PIPE SUPPLY COVERS

- A. General:
 - 1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
 - 2. Construction: 1/8 inch (3.2 mm) PVC with antimicrobial, antifungal and UV resistant properties.
 - a. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
 - b. Comply with ICC A117.1.

2.08 SHOWERS

- A. Manufacturers:
 - 1. MOEN
- B. Shower Trim:
 - 1. Two Handle: ASME A112.18.1; concealed rough brass metering valve with closed fluid metering system adjustable from 5 to 120 seconds, chrome plated push button and escutcheon, wheel handle stop.
- C. Shower Head:
 - 1. ASME A112.18.1; chrome plated vandal-proof institutional head with integral wall bracket, built-in 2.5 gpm (9.4 Lpm) flow control.

- D. Hand-Held Shower Head:
 1. ASME A112.18.1, adjustable spray hand-held shower head with swivel fitting with ASSE 1014 backflow preventer.
 2. Include 60 inch (1525 mm) minimum flexible polished stainless steel hose and in-line vacuum breaker
- E. Thermostatic Mixing Valve:
 1. ASSE 1070 listed with combination stop, strainer, and check valves, and flexible stainless steel connectors.

2.09 BOTTLE FILLING DRINKING FOUNTAINS

- A. Manufacturers:
 1. Elkay Manufacturing Company: www.elkay.com/#sle.

2.10 ELECTRIC WATER COOLERS

- A. Manufacturers:
 1. Elkay Manufacturing Company: www.elkay.com/#sle.
- B. Water Cooler: Electric, mechanically refrigerated; surface mounted, ADA compliant; stainless steel top, vinyl on steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.
 1. Capacity: 8 gph (30.3 Lph) of 50 degrees F (10 degrees C) water with inlet at 80 degrees F (27 degrees C) and room temperature of 90 degrees F (32 degrees C), when tested in accordance with ASHRAE Std 18.
 2. Electrical: 115 VAC, 60 Hertz compressor, 6 foot (2 m) cord and plug for connection to electric wiring system including grounding connector.

2.11 BI-LEVEL, ELECTRIC WATER COOLERS

- A. Manufacturers:
 1. Elkay Manufacturing Company: www.elkay.com/#sle.
- B. Water Cooler: Bi-level, electric, mechanically refrigerated; surface mounted, ADA compliant; stainless steel top, vinyl on steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.
 1. Capacity: 8 gph (30.3 Lph) of 50 degrees F (10 degrees C) water with inlet at 80 degrees F (27 degrees C) and room temperature of 90 degrees F (32 degrees C), when tested in accordance with ASHRAE Std 18.
 2. Electrical: 115 VAC, 60 Hertz compressor, 6 foot (2 m) cord and plug for connection to electric wiring system including grounding connector.

2.12 MOP SINKS

- A. Manufacturers:
 1. Floestone.
- B. Material: Precast terrazzo composed of marble chips cast in Portland cement.
- C. Grid strainer: Stainless steel; integral; removable.
- D. Dimensions: As indicated on drawings.

2.13 SERVICE SINKS

- A. Manufacturers:
 1. Floestone.

2.14 EMERGENCY EYE AND FACE WASH

- A. Manufacturers:
 1. Guardian.
- B. Emergency Wash: ANSI Z358.1; wall-mounted, self-cleaning, nonclogging eye and face wash with quick opening, full-flow valves, stainless steel eye and face wash receptor, twin eye wash heads and face spray ring, stainless steel dust cover, copper alloy control valve and fittings.
- C. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall supports and bolts.
- E. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.05 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

- A. Clean plumbing fixtures and equipment.

3.07 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Repair or replace damaged products before Date of Substantial Completion.

3.08 SCHEDULES

- A. Fixture Heights: Install fixtures to heights above finished floor as indicated.
 - 1. Water Closet:
 - a. Standard: 15 inches (380 mm) to top of bowl rim.
 - b. Accessible: 18 inches (455 mm) to top of seat.
 - 2. Water Closet Flush Valves:
 - a. Standard: 11 inches (280 mm) min. above bowl rim.
 - 3. Urinal:
 - a. Standard: 22 inches (560 mm) to top of bowl rim.
 - b. Accessible: 17 inches (430 mm) to top of bowl rim.
 - 4. Lavatory:
 - a. Standard: 31 inches (785 mm) to top of basin rim.
 - b. Accessible: 34 inches (865 mm) to top of basin rim.
 - 5. Drinking Fountain:
 - a. Standard Adult: 40 inches (1015 mm) to top of basin rim.
 - b. Accessible: 36 inches (915 mm) to top of spout.
 - 6. Shower Heads:
 - a. Adult Male: 69.5 inches (1765 mm) to bottom of head.
 - b. Adult Female: 64.5 inches (1640 mm) to bottom of head.
- B. Fixture Rough-In
 - 1. Water Closet (Flush Valve Type):
 - a. Cold Water: 1 Inch (25 mm).
 - b. Waste: 4 Inch (100 mm).

- c. Vent: 2 Inch (50 mm).
- 2. Urinal (Flush Valve Type):
 - a. Cold Water: 3/4 Inch (20 mm).
 - b. Waste: 2 Inch (50 mm).
 - c. Vent: 1-1/2 Inch (40 mm).
- 3. Lavatory:
 - a. Hot Water: 1/2 Inch (15 mm).
 - b. Cold Water: 1/2 Inch (15 mm).
 - c. Waste: 1-1/2 Inch (40 mm).
 - d. Vent: 1-1/4 Inch (32 mm).
- 4. Sink:
 - a. Hot Water: 1/2 Inch (15 mm).
 - b. Cold Water: 1/2 Inch (15 mm).
 - c. Waste: 1-1/2 Inch (40 mm).
 - d. Vent: 1-1/4 Inch (32 mm).
- 5. Service Sink:
 - a. Hot Water: 1/2 Inch (15 mm).
 - b. Cold Water: 1/2 Inch (15 mm).
 - c. Waste: 2 Inch (50 mm).
 - d. Vent: 1-1/2 Inch (40 mm).
- 6. Service Sink:
 - a. Hot Water: 1/2 Inch (15 mm).
 - b. Cold Water: 1/2 Inch (15 mm).
 - c. Waste: 3 Inch (80 mm).
 - d. Vent: 1-1/2 Inch (40 mm).
- 7. Drinking Fountain:
 - a. Cold Water: 1/2 Inch (15 mm).
 - b. Waste: 1-1/4 Inch (32 mm).
 - c. Vent: 1-1/4 Inch (32 mm).
- 8. Bathtub:
 - a. Hot Water: 1/2 Inch (15 mm).
 - b. Cold Water: 1/2 Inch (15 mm).
 - c. Waste: 1-1/2 Inch (40 mm).
 - d. Vent: 1-1/4 Inch (32 mm).
- 9. Shower:
 - a. Hot Water: 1/2 Inch (15 mm).
 - b. Cold Water: 1/2 Inch (15 mm).
 - c. Waste: 2" (40 mm).
 - d. Vent: 1-1/2 Inch (32 mm).

END OF SECTION 224000

**SECTION 230513
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General construction and requirements.
- B. Applications.
- C. Single phase electric motors.
- D. Three phase electric motors.
- E. Electronically Commutated Motors (ECM).

1.02 REFERENCE STANDARDS

- A. NEMA MG 1 - Motors and Generators 2018.
- B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.
- C. Test Reports: Indicate test results verifying nominal efficiency and power factor for three phase motors larger than 1/2 horsepower.
- D. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.
- E. Operation Data: Include instructions for safe operating procedures.
- F. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacture of electric motors for commercial use, and their accessories, with minimum three years documented product development, testing, and manufacturing experience.
- B. Comply with NFPA 70.
- C. Provide certificate of compliance from Authority Having Jurisdiction indicating approval of high efficiency motors.
- D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer warranty for motors larger than 20 horsepower.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 GENERAL CONSTRUCTION AND REQUIREMENTS

- A. Construction:
 - 1. Open drip-proof type except where specifically noted otherwise.
 - 2. Design for continuous operation in 104 degrees F (40 degrees C) environment.
 - 3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

- B. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.
- C. Wiring Terminations:
 - 1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
 - 2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.03 APPLICATIONS

2.04 ELECTRONICALLY COMMUTATED MOTORS (ECM)

- A. Applications:
 - 1. Commercial:
 - a. DX Fan Coil Unit:
 - 1) Operating Mode: Constant cfm.
 - 2) Input: Motor manufacturer to coordinate control requirements with the control board of the DX fan coil unit and/or specified sequence of operation.
 - 3) Options: Remote mount control/User-Interface.
 - b. Power Roof Ventilator (PRV):
 - 1) Operating Mode: Constant cfm.
 - 2) Input: Motor manufacturer to coordinate control requirements with the control board of the PRV and/or specified sequence of operation.
 - 3) Options: Remote mount control.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION 230513

SECTION 230593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition 2016.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems 2008 (Reaffirmed 2017).
- C. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing 2002.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 - 1. AABC (NSTSB), AABC National Standards for Total System Balance.
 - 2. SMACNA (TAB).
 - 3. Maintain at least one copy of the standard to be used at project site at all times.
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. TAB Agency Qualifications:
 - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 - 2. Having minimum of three years documented experience.
 - 3. Certified by one of the following:
 - a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
 - b. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.
- D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.
 - 6. Fans are rotating correctly.
 - 7. Fire and volume dampers are in place and open.
 - 8. Air coil fins are cleaned and combed.
 - 9. Access doors are closed and duct end caps are in place.
 - 10. Air outlets are installed and connected.
 - 11. Duct system leakage is minimized.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Beginning of work means acceptance of existing conditions.

3.03 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.04 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Measure air quantities at air inlets and outlets.
- C. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- D. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- E. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- F. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- G. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- H. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

END OF SECTION 230593

SECTION 230713 DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Duct insulation.
- B. Duct liner.
- C. Insulation jackets.

1.02 REFERENCE STANDARDS

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2021.
- B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form 2020a.
- C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications 2013 (Reapproved 2019).
- D. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation 2014 (Reapproved 2019).
- E. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material) 2019.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
- H. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi 2015 (Reapproved 2021)e1.
- I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

- A. Manufacturer:
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
 - 1. K (Ksi) value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C518.
 - 2. Maximum Service Temperature: 1200 degrees F (649 degrees C).
 - 3. Maximum Water Vapor Absorption: 5.0 percent by weight.
- C. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/Pa s m), when tested in accordance with ASTM E96/E96M.

2.03 GLASS FIBER, RIGID

- A. Insulation: ASTM C612; rigid, noncombustible blanket.
 - 1. K (Ksi) Value: 0.24 at 75 degrees F (0.036 at 24 degrees C), when tested in accordance with ASTM C518.
 - 2. Maximum Service Temperature: 450 degrees F (232 degrees C).
 - 3. Maximum Water Vapor Absorption: 5.0 percent.
 - 4. Maximum Density: 8.0 lb/cu ft (128 kg/cu m).
- B. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.

2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
3. Secure with pressure sensitive tape.

2.04 JACKETS

- A. Canvas Jacket: UL listed 6 oz/sq yd (220 g/sq m) plain weave cotton fabric treated with dilute fire retardant lagging adhesive.

2.05 DUCT LINER

- A. Manufacturers:
 1. Armacell LLC; AP Coilflex: www.armacell.us/#sle.
 2. CertainTeed Corporation: www.certainteed.com/#sle.
 3. Ductmate Industries, Inc, a DMI Company: www.ductmate.com/#sle.
 4. Johns Manville: www.jm.com/#sle.
 5. Knauf Insulation: www.knaufinsulation.com/#sle.
- B. Note: Choose the liner type - Elastomeric Foam or Glass Fiber.
- C. Elastomeric Foam Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
 1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
 2. Maximum Service Temperature: 180 degrees F (82 degrees C).
 3. Fungal Resistance: No growth when tested according to ASTM G21.
 4. Apparent Thermal Conductivity: Maximum of 0.28 at 75 degrees F (0.045 at 24 degrees C).
 5. Minimum Noise Reduction Coefficients:
 - a. 1/2 inch (13 mm) Thickness: 0.30.
 - b. 1 inch (25 mm) Thickness: 0.40.
 - c. 1-1/2 inches (40 mm) Thickness: 0.50.
 - d. 2 inch (50 mm) Thickness: 0.60.
 6. Erosion Resistance: Does not show evidence of breaking away, flaking off, or delamination at velocities of 10,000 fpm (50.8 m/s) per ASTM C1071.
 7. Connection: Waterproof vapor barrier adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Test ductwork for design pressure prior to applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated Ducts Conveying Air Below Ambient Temperature:
 1. Provide insulation with vapor barrier jackets.

END OF SECTION 230713

**SECTION 231123
FACILITY NATURAL-GAS PIPING**

PART 2 PRODUCTS

1.01 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M, Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
 - 2. Joints: Threaded or welded to ASME B31.1.

1.02 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches (80 mm) and Under:
 - 1. Ferrous Pipe: Class 150 malleable iron threaded unions.

1.03 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
 - 3. Trapeze Hangers: Welded steel channel frames attached to structure.
 - 4. Vertical Pipe Support: Steel riser clamp.

1.04 PLUG VALVES

- A. Construction 3/4 Inches (19 mm) and Larger: MSS SP-78, 175 psi (1200 kPa) CWP, cast iron body and plug, pressure lubricated, Teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

PART 3 EXECUTION

2.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- C. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 230516.
- F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- G. Provide access where valves and fittings are not exposed.
- H. Sleeve pipes passing through partitions, walls and floors.

2.02 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- C. Provide plug valves in natural gas systems for shut-off service.

2.03 SERVICE CONNECTIONS

- A. Provide new gas service complete with gas meter and regulators in accordance with Section 335216. Gas service distribution piping to have initial minimum pressure of 7 inch wg (1.75 kPa). Provide regulators on each line serving gravity type appliances, sized in accordance with equipment.

END OF SECTION 231123

This page intentionally left blank

SECTION 232300 REFRIGERANT PIPING

PART 2 PRODUCTS

1.01 PIPING

- A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
 - 1. Fittings: ASME B16.22 wrought copper.
 - 2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.
- B. Pipe Supports and Anchors:
 - 1. Provide hangers and supports that comply with MSS SP-58.
 - a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch (13 to 38 mm): Malleable iron adjustable swivel, split ring.
 - 3. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
 - 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 5. Wall Support for Pipe Sizes to 3 Inches (75 mm): Cast iron hook.
 - 6. Vertical Support: Steel riser clamp.
 - 7. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
 - 8. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
 - 9. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

1.02 REFRIGERANT

- A. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

1.03 MOISTURE AND LIQUID INDICATORS

- A. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F (93 degrees C) and maximum working pressure of 500 psi (3450 kPa).

1.04 VALVES

1.05 STRAINERS

1.06 FILTER-DRIERS

- A. Performance:
 - 1. Flow Capacity - Liquid Line: Per manufacturer's written instructions, minimum, rated in accordance with AHRI 710.
 - 2. Pressure Drop: 2 psi (14 kPa), maximum, when operating at full connected evaporator capacity.
 - 3. Design Working Pressure: 350 psi (2410 kPa), minimum.
- B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.
- C. Construction: UL listed.
 - 1. Connections: As specified for applicable pipe type.

PART 3 EXECUTION

2.01 INSTALLATION

- A. Install refrigeration specialties in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and avoid interference with use of space.

- D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

END OF SECTION 232300

SECTION 233423
HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program 2015.
- B. AMCA 99 - Standards Handbook 2016.
- C. AMCA 204 - Balance Quality and Vibration Levels for Fans 2005 (Reaffirmed 2012).
- D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating 2016.
- E. AMCA 300 - Reverberant Room Method for Sound Testing of Fans 2014.
- F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data 2014.
- G. UL 705 - Power Ventilators Current Edition, Including All Revisions.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.04 FIELD CONDITIONS

- A. Permanent ventilators may not be used for ventilation during construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Greenheck Fan Corporation: www.greenheck.com/#sle.
- B. Loren Cook Company: www.lorencook.com/#sle.
- C. PennBarry, Division of Air System Components: www.pennbarry.com/#sle.

2.02 POWER VENTILATORS - GENERAL

- A. Static and Dynamically Balanced: Comply with AMCA 204.
- B. Performance Ratings: Comply with AMCA 210, bearing certified rating seal.
- C. Sound Ratings: Comply with AMCA 301, tested to AMCA 300, bearing certified sound ratings seal.
- D. Fabrication: Comply with AMCA 99.
- E. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.
- F. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.03 ROOF EXHAUSTERS

- A. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch (13 mm) mesh, 0.62 inch (1.6 mm) thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.
- B. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.
- C. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.
- C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.
- D. Provide sheaves required for final air balance.
- E. Install backdraft dampers on inlet to roof and wall exhausters.

END OF SECTION 233423

SECTION 233700 AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. AMCA 511 - Certified Ratings Program for Air Control Devices 2010.
- B. AMCA 550 - Test Method for High Velocity Wind Driven Rain Resistant Louvers 2015, with Editorial Revision (2018).
- C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2020.
- D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2013.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hart & Cooley, Inc: www.hartandcooley.com/#sle.
- B. Price Industries: www.price-hvac.com/#sle.
- C. Ruskin Company: www.ruskin.com/#sle.
- D. Titus, a brand of Air Distribution Technologies: www.titus-hvac.com/#sle.
- E. Tuttle and Bailey: www.tuttleandbailey.com/#sle.

2.02 LOUVERS

- A. Manufacturers:
 - 1. Ruskin Company: www.ruskin.com/#sle.
 - 2. Greenheck.

2.03 GRAVITY VENTILATORS

- A. Hood Intake and Relief Gravity Ventilator:
 - 1. Manufacturers:
 - a. Greenheck Fan Corporation: www.greenheck.com/#sle.
 - b. Loren Cook Company: www.lorencook.com/#sle.
 - c. Ruskin.
- B. Extruded Aluminum Intake Ventilator:
 - 1. Manufacturers:
 - a. Greenheck Fan Corporation: www.greenheck.com/#sle.
 - b. Loren Cook Company: www.lorencook.com/#sle.
 - 2. Construction:
 - a. Extruded aluminum louvers, 0.081 inch (2.06 mm) thick, mitered at corners and welded for maximum strength.
 - b. Removable Hood: 0.05 inch (1.27 mm), reinforced and braced for extra strength.
 - c. Base: 0.08 inch (2.032 mm) aluminum with mitered corners and seams with continuous weld for strength and tightness.
 - d. Bird Screen Galvanized welded wire fabricated in accordance with ASTM B221 (ASTM B221M).
 - e. Performance ratings and factory testing to be in accordance with AMCA 511 and AMCA 550.
 - 3. Options/Accessories:
 - a. Cleanable filters.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

END OF SECTION 233700

**SECTION 234000
HVAC AIR CLEANING DEVICES**

PART 2 PRODUCTS

1.01 DISPOSABLE, EXTENDED AREA PANEL FILTERS

- A. Media: UL 900 Class 1, pleated, lofted, non-woven, reinforced cotton fabric; supported and bonded to welded wire grid by corrugated aluminum separators.
- B. Minimum Efficiency Reporting Value (MERV): 8, when tested in accordance with ASHRAE Std 52.2.

1.02 FILTER FRAMES AND HOUSINGS

- A. General: Fabricate filter frames and supporting structures of 16 gauge, 0.0598 inch (1.52 mm) galvanized steel or extruded aluminum T-section construction with necessary gasketing between frames and walls.
- B. Standard Sizes: Provide for interchangeability of filter media of other manufacturers; for panel filters, size for 24 by 24 inches (610 by 610 mm) filter media, minimum 2 inches (50 mm) thick; for extended surface and high efficiency particulate air filters, provide for upstream mounting of panel filters.

PART 3 EXECUTION

2.01 INSTALLATION

- A. Install air cleaning devices in accordance with manufacturer's instructions.
- B. Prevent passage of unfiltered air around filters with felt, rubber, or neoprene gaskets.
- C. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with clean set.

END OF SECTION 234000

This page intentionally left blank

SECTION 238126.13
SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

PART 2 PRODUCTS

1.01 MANUFACTURERS

- A. Trane Inc: www.trane.com/#sle.

1.02 SYSTEM DESIGN

- A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
1. Heating: Heat Pump.
 2. Cooling: Outdoor electric condensing unit with evaporator coil in central ducted indoor unit.
 3. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.
- B. Performance Requirements: See Drawings for additional requirements.
1. Efficiency:
 - a. Comply with ASHRAE Std 90.1.
- C. Electrical Characteristics:
1. See plans for kW.
 2. 208 volts, single phase, 60 Hz.
 3. See plans for amperes maximum fuse size.
 4. Disconnect Switch: Factory mount disconnect switch on equipment under provisions of Section 260583.

1.03 INDOOR AIR HANDLING UNITS FOR DUCTED SYSTEMS

- A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating and cooling element(s), controls, and accessories; wired for single power connection with control transformer.
1. Air Flow Configuration: Horizontal.
 2. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
- B. Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.
1. Motor: NEMA MG 1; 1750 rpm single speed, permanently lubricated, hinge mounted.
 2. Motor Electrical Characteristics:
- C. Air Filters: 1 inch (25 mm) thick glass fiber, disposable type arranged for easy replacement.
- D. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
 2. Manufacturers: System manufacturer.

1.04 INDOOR AIR HANDLING UNITS FOR DUCTLESS SYSTEMS

- A. Manufacturers:
1. Trane/Mitsubishi.
- B. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.
1. Filter return air with washable, antioxidant pre-filter and a pleated anti-allergy enzyme filter.
- C. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
 2. Manufacturer: System manufacturer.

1.05 OUTDOOR UNITS

- A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
 - 1. Comply with AHRI 210/240.
 - 2. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.
 - 3. Refrigerant: R-410A.
 - 4. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
 - 5. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23.1 and UL 207.
- B. Compressor: Hermetic, two speed 1800 and 3600 rpm, AHRI 520 resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling and rapid speed changes.
- C. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
- D. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).
 - 1. Provide thermostatic expansion valves.
- E. Operating Controls:
 - 1. Control by room thermostat to maintain room temperature setting.
 - 2. Low Ambient Kit: Provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig (1965 kPa) and off when pressure drops below 140 psig (965 kPa) for operation to 0 degrees F (-18 degrees C).

PART 3 EXECUTION

2.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.
- B. Install in accordance with NFPA 90A and NFPA 90B.
- C. Install refrigeration systems in accordance with ASHRAE Std 15.

END OF SECTION 238126.13

SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single conductor building wire.
- B. Underground feeder and branch-circuit cable.
- C. Service entrance cable.
- D. Armored cable.
- E. Metal-clad cable.
- F. Power and control tray cable.
- G. Wiring connectors.
- H. Electrical tape.
- I. Heat shrink tubing.
- J. Oxide inhibiting compound.
- K. Wire pulling lubricant.
- L. Cable ties.
- M. Firestop sleeves.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 262100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conductors.
- E. Section 284600 - Fire Detection and Alarm: Fire alarm system conductors and cables.

1.03 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft 2011 (Reapproved 2017).
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation 2004 (Reapproved 2020).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape 2017.
- F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes 2013.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- H. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC) 2012.
- I. NECA 121 - Standard for Installing Nonmetallic-Sheathed Cable (Type NM-B) and Underground Feeder and Branch-Circuit Cable (Type UF) 2007.
- J. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy 2021.
- K. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.

- L. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- M. UL 4 - Armored Cable Current Edition, Including All Revisions.
- N. UL 44 - Thermoset-Insulated Wires and Cables Current Edition, Including All Revisions.
- O. UL 83 - Thermoplastic-Insulated Wires and Cables Current Edition, Including All Revisions.
- P. UL 486A-486B - Wire Connectors Current Edition, Including All Revisions.
- Q. UL 486C - Splicing Wire Connectors Current Edition, Including All Revisions.
- R. UL 486D - Sealed Wire Connector Systems Current Edition, Including All Revisions.
- S. UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables Current Edition, Including All Revisions.
- T. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape Current Edition, Including All Revisions.
- U. UL 854 - Service-Entrance Cables Current Edition, Including All Revisions.
- V. UL 1277 - Electrical Power and Control Tray Cables with Optional Optical-Fiber Members Current Edition, Including All Revisions.
- W. UL 1569 - Metal-Clad Cables Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate the installation of direct burial cable with other trades to avoid conflicts with piping or other potential conflicts.
 - 3. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
 - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- C. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Service entrance cable is permitted only as follows:
 - 1. Where not otherwise restricted, may be used:
 - a. For overhead service drop, installed in raceway to service head.
 - b. For underground service entrance, installed in raceway.
 - 2. In addition to other applicable restrictions, may not be used:
 - a. Where exposed to damage.
- E. Armored cable is permitted only as follows:
 - 1. Where not otherwise restricted, may be used:
 - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
 - 1) Maximum Length: 6 feet (1.8 m).
 - b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
 - 1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
- F. Metal-clad cable is permitted only as follows:
 - 1. Where not otherwise restricted, may be used:
 - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
 - 1) Maximum Length: 6 feet (1.8 m).
 - b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
 - 1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
- G. Manufactured wiring systems are not permitted.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductors for Grounding and Bonding: Also comply with Section 260526.
- H. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.
- I. Conductor Material:
 - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
 - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
 - 3. Tinned Copper Conductors: Comply with ASTM B33.
- J. Minimum Conductor Size:

1. Branch Circuits: 12 AWG.
 - a. Exceptions:
 - 1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
 - 2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
 - 3) 20 A, 277 V circuits longer than 150 feet (46 m): 10 AWG, for voltage drop.
 2. Control Circuits: 14 AWG.
- K. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- L. Conductor Color Coding:
1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 2. Color Coding Method: Integrally colored insulation.
 - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
 3. Color Code:
 - a. 480Y/277 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - 4) Neutral/Grounded: Gray.
 - b. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - c. Equipment Ground, All Systems: Green.
 - d. Travelers for 3-Way and 4-Way Switching: Pink.
 - e. For control circuits, comply with manufacturer's recommended color code.

2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Manufacturers:
1. Copper Building Wire:
 - a. Cerro Wire LLC: www.cerrowire.com/#sle.
 - b. Encore Wire Corporation: www.encorewire.com/#sle.
 - c. General Cable Technologies Corporation: www.generalcable.com/#sle.
 - d. Service Wire Co: www.servicewire.com/#sle.
 - e. Southwire Company: www.southwire.com/#sle.
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
 - a. Size 4 AWG and Larger: Type XHHW-2.
 - b. Installed Underground: Type XHHW-2.
 - c. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

2.04 UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE

- A. Manufacturers:
1. Cerro Wire LLC: www.cerrowire.com/#sle.
 2. Encore Wire Corporation: www.encorewire.com/#sle.
 3. Service Wire Co: www.servicewire.com/#sle.
 4. Southwire Company: www.southwire.com/#sle.

- B. Description: NFPA 70, Type UF multiple-conductor cable listed and labeled as complying with UL 493, Type UF-B.
- C. Provide equipment grounding conductor unless otherwise indicated.
- D. Conductor Stranding:
 - 1. Size 10 AWG and Smaller: Solid.
 - 2. Size 8 AWG and Larger: Stranded.
- E. Insulation Voltage Rating: 600 V.

2.05 SERVICE ENTRANCE CABLE

- A. Manufacturers:
 - 1. Copper Service Entrance Cable:
 - a. Cerro Wire LLC: www.cerrowire.com/#sle.
 - b. Encore Wire Corporation: www.encorewire.com/#sle.
 - c. Service Wire Co: www.servicewire.com/#sle.
 - d. Southwire Company: www.southwire.com/#sle.
- B. Service Entrance Cable for Above-Ground Use: NFPA 70, Type SE multiple-conductor cable listed and labeled as complying with UL 854, Style R.
- C. Service Entrance Cable for Underground Use: NFPA 70, Type USE single-conductor cable listed and labeled as complying with UL 854, Type USE-2, and with UL 44 Type RHH/RHW-2.
- D. Conductor Stranding: Stranded.
- E. Insulation Voltage Rating: 600 V.

2.06 ARMORED CABLE

- A. Manufacturers:
 - 1. AFC Cable Systems Inc: www.afcweb.com/#sle.
 - 2. Encore Wire Corporation: www.encorewire.com/#sle.
 - 3. Southwire Company: www.southwire.com/#sle.
- B. Description: NFPA 70, Type AC cable listed and labeled as complying with UL 4, and listed for use in classified firestop systems to be used.
- C. Conductor Stranding:
 - 1. Size 10 AWG and Smaller: Solid.
 - 2. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation: Type THHN.
- F. Grounding: Combination of interlocking armor and integral bonding wire.
- G. Armor: Steel, interlocked tape.

2.07 METAL-CLAD CABLE

- A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- B. Conductor Stranding:
 - 1. Size 10 AWG and Smaller: Solid.
 - 2. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- E. Grounding: Full-size integral equipment grounding conductor.
- F. Armor: Steel, interlocked tape.

2.08 POWER AND CONTROL TRAY CABLE

- A. Manufacturers:
 - 1. Encore Wire Corporation: www.encorewire.com/#sle.
 - 2. General Cable Technologies Corporation: www.generalcable.com/#sle.
 - 3. Okonite: www.okonite.com/#sle.

4. Service Wire Co: www.servicewire.com/#sle.
 5. Southwire Company: www.southwire.com/#sle.
- B. Description: NFPA 70, Type TC cable listed and labeled as complying with UL 1277.
 - C. Conductor Stranding: Stranded.
 - D. Insulation Voltage Rating: 600 V.
 - E. Insulation: Type XHHW or XHHW-2.
 - F. Jacket: PVC or Chlorinated Polyethylene (CPE).

2.09 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 260526.
- C. Wiring Connectors for Splices and Taps:
 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- D. Wiring Connectors for Terminations:
 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
 3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
 4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
 5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
 6. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
 7. Conductors for Control Circuits: Use crimped terminals for all connections.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
- H. Mechanical Connectors: Provide bolted type or set-screw type.
- I. Compression Connectors: Provide circumferential type or hex type crimp configuration.
- J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

2.10 ACCESSORIES

- A. Electrical Tape:
 1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).

3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.
 4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).
 5. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil (0.18 mm); suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 6. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil (2.3 mm).
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
 - C. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
 - D. Cable Ties: Material and tensile strength rating suitable for application.
 - E. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.
 - F. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

- A. Circuiting Requirements:
 1. Unless dimensioned, circuit routing indicated is diagrammatic.
 2. When circuit destination is indicated without specific routing, determine exact routing required.
 3. Arrange circuiting to minimize splices.
 4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.
 5. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
 6. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is permitted, under the following conditions:
 - a. Increase size of conductors as required to account for ampacity derating.
 - b. Size raceways, boxes, etc. to accommodate conductors.
 7. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
- B. Install products in accordance with manufacturer's instructions.

- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Install underground feeder and branch-circuit cable (Type UF-B) in accordance with NECA 121.
- E. Install armored cable (Type AC) in accordance with NECA 120.
- F. Install metal-clad cable (Type MC) in accordance with NECA 120.
- G. Installation in Raceway:
 - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 - 2. Pull all conductors and cables together into raceway at same time.
 - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- H. Exposed Cable Installation (only where specifically permitted):
 - 1. Route cables parallel or perpendicular to building structural members and surfaces.
 - 2. Protect cables from physical damage.
- I. Direct Burial Cable Installation:
 - 1. Install cable with minimum cover of 24 inches (610 mm) unless otherwise indicated or required.
 - 2. Protect cables from damage in accordance with NFPA 70.
 - 3. Provide underground warning tape in accordance with Section 260553 along entire cable length.
- J. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- K. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- L. Terminate cables using suitable fittings.
 - 1. Armored Cable (Type AC):
 - a. Use listed fittings and anti-short, insulating bushings.
 - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
 - 2. Metal-Clad Cable (Type MC):
 - a. Use listed fittings.
 - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- M. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- N. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- O. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- P. Make wiring connections using specified wiring connectors.
 - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 - 3. Do not remove conductor strands to facilitate insertion into connector.
 - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminants. Do not use wire brush on plated connector surfaces.
 - 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

- Q. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
 - b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
 2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
 - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
- R. Insulate ends of spare conductors using vinyl insulating electrical tape.
- S. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- T. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- U. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
- D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION 260519

This page intentionally left blank

SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.
- E. Ground rod electrodes.

1.02 RELATED REQUIREMENTS

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- C. Section 265600 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

1.03 REFERENCE STANDARDS

- A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings 2017.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 467 - Grounding and Bonding Equipment Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify exact locations of underground metal water service pipe entrances to building.
 - 2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
 - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

- C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- D. Grounding System Resistance:
 - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
 - 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
 - 3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.
- E. Grounding Electrode System:
 - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
 - a. Provide continuous grounding electrode conductors without splice or joint.
 - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
 - 2. Metal Underground Water Pipe(s):
 - a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet (3.0 m) at an accessible location not more than 5 feet (1.5 m) from the point of entrance to the building.
 - b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
 - c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
 - 3. Ground Rod Electrode(s):
 - a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
 - b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.
 - 4. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
 - 5. Ground Riser: Provide common grounding electrode conductor not less than 3/0 AWG for tap connections to multiple separately derived systems as permitted in NFPA 70.
- F. Service-Supplied System Grounding:
 - 1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
 - 2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.
- G. Separately Derived System Grounding:
 - 1. Separately derived systems include, but are not limited to:
 - a. Transformers (except autotransformers such as buck-boost transformers).
 - b. Generators, when neutral is switched in the transfer switch.
 - 2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
 - 3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
 - 4. Where common grounding electrode conductor ground riser is used for tap connections to multiple separately derived systems, provide bonding jumper to connect the metal building frame and metal water piping in the area served by the

- derived system to the common grounding electrode conductor.
5. Outdoor Source: Where the source of the separately derived system is located outside the building or structure supplied, provide connection to grounding electrode at source in accordance with NFPA 70.
 6. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
 7. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.
- H. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
 2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
 3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
 4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
 6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
 7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
 - a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
 - b. Metal gas piping.
 8. Provide bonding for metal building frame.
 9. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.
- I. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
 2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
 - a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
 - b. Raceway Size: 3/4 inch (21 mm) trade size unless otherwise indicated or required.
 - c. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.
 - d. Ground Bar Mounting Height: 18 inches (450 mm) above finished floor unless otherwise indicated.

2.02 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - 1) Use bare copper conductors where installed underground in direct contact with earth.

- 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:
 1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
 2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
 3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
 - D. Ground Bars:
 1. Description: Copper rectangular ground bars with mounting brackets and insulators.
 2. Size: As indicated.
 3. Holes for Connections: As indicated or as required for connections to be made.
 - E. Ground Rod Electrodes:
 1. Comply with NEMA GR 1.
 2. Material: Copper-bonded (copper-clad) steel.
 3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
 1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches (150 mm) below finished grade.
- D. Make grounding and bonding connections using specified connectors.
 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- E. Identify grounding and bonding system components in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.13.
- D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

- E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION 260526

This page intentionally left blank

**SECTION 260529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 055000 - Metal Fabrications: Materials and requirements for fabricated metal supports.
- C. Section 260533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- D. Section 260533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2019.
- D. MFMA-4 - Metal Framing Standards Publication 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 5B - Strut-Type Channel Raceways and Fittings Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

1.05 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with applicable building code.
- C. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
 - 5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
 - 6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
 - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
 - 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 - 2. Conduit Clamps: Bolted type unless otherwise indicated.
- C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
- D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 - 1. Comply with MFMA-4.
 - 2. Channel (Strut) Used as Raceway (only where specifically indicated): Listed and labeled as complying with UL 5B.
 - 3. Channel Material:
 - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
 - 4. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm).
 - 5. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.
 - 6. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com/#sle.
 - b. Thomas & Betts Corporation: www.tnb.com/#sle.
 - c. Unistrut, a brand of Atkore International Inc: www.unistrut.com/#sle.
- E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
 - 1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch (13 mm) diameter.
 - b. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch (6 mm) diameter.
 - c. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch (10 mm) diameter.
 - d. Trapeze Support for Multiple Conduits: 3/8 inch (10 mm) diameter.
 - e. Outlet Boxes: 1/4 inch (6 mm) diameter.
 - f. Luminaires: 1/4 inch (6 mm) diameter.
- F. Anchors and Fasteners:
 - 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 - 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.

3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
4. Hollow Masonry: Use toggle bolts.
5. Hollow Stud Walls: Use toggle bolts.
6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
7. Sheet Metal: Use sheet metal screws.
8. Wood: Use wood screws.
9. Plastic and lead anchors are not permitted.
10. Powder-actuated fasteners are not permitted.
11. Hammer-driven anchors and fasteners are not permitted.
12. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.
 - c. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm) minimum base metal thickness.
 - d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
13. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- E. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- F. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- H. Field-Welding (where approved by Architect): Comply with Section 055000.
- I. Equipment Support and Attachment:
 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- J. Conduit Support and Attachment: Also comply with Section 260533.13.
- K. Box Support and Attachment: Also comply with Section 260533.16.
- L. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- M. Secure fasteners according to manufacturer's recommended torque settings.
- N. Remove temporary supports.

- O. Identify independent electrical component support wires above accessible ceilings (only where specifically indicated or permitted) with color distinguishable from ceiling support wires in accordance with NFPA 70.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 260529

SECTION 260533.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Aluminum rigid metal conduit (RMC).
- C. Intermediate metal conduit (IMC).
- D. PVC-coated galvanized steel rigid metal conduit (RMC).
- E. Flexible metal conduit (FMC).
- F. Liquidtight flexible metal conduit (LFMC).
- G. Electrical metallic tubing (EMT).
- H. Rigid polyvinyl chloride (PVC) conduit.
- I. Liquidtight flexible nonmetallic conduit (LFNC).
- J. Reinforced thermosetting resin conduit (RTRC).
- K. Conduit fittings.
- L. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete encasement of conduits.
- B. Section 078400 - Firestopping.
- C. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Metal clad cable (Type MC), armored cable (Type AC), and manufactured wiring systems, including uses permitted.
- D. Section 260526 - Grounding and Bonding for Electrical Systems.
 - 1. Includes additional requirements for fittings for grounding and bonding.
- E. Section 260529 - Hangers and Supports for Electrical Systems.
- F. Section 260533.16 - Boxes for Electrical Systems.
- G. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- H. Section 262100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.
- I. Section 271000 - Structured Cabling: Additional requirements for communications systems conduits.
- J. Section 312316 - Excavation.
- K. Section 312323 - Fill: Bedding and backfilling.

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC) 2015.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S) 2015.
- C. ANSI C80.5 - American National Standard for Electrical Rigid Metal Conduit -- Aluminum (ERMC-A) 2015.
- D. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC) 2018.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- F. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT) 2013.
- G. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit 2004.
- H. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) 2017.
- I. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.

- J. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit 2018.
- K. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit 2020.
- L. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing 2021.
- M. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series 2015.
- N. NEMA TC 14.AG - Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings 2015.
- O. NEMA TC 14.BG - Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings 2015.
- P. NEMA TC 14.XW - Extra Heavy Wall Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings 2015.
- Q. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- R. UL 1 - Flexible Metal Conduit Current Edition, Including All Revisions.
- S. UL 6 - Electrical Rigid Metal Conduit-Steel Current Edition, Including All Revisions.
- T. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel Current Edition, Including All Revisions.
- U. UL 360 - Liquid-Tight Flexible Steel Conduit Current Edition, Including All Revisions.
- V. UL 514B - Conduit, Tubing, and Cable Fittings Current Edition, Including All Revisions.
- W. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings Current Edition, Including All Revisions.
- X. UL 797 - Electrical Metallic Tubing-Steel Current Edition, Including All Revisions.
- Y. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations Current Edition, Including All Revisions.
- Z. UL 1242 - Electrical Intermediate Metal Conduit-Steel Current Edition, Including All Revisions.
- AA. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit Current Edition, Including All Revisions.
- BB. UL 2420 - Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings Current Edition, Including All Revisions.
- CC. UL 2515 - Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings Current Edition, Including All Revisions.
- DD. UL 2515A - Standard for Supplemental Requirements for Extra Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
 - 4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
 - 1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 - 2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 - 3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 - 4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
 - 5. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.
 - 6. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.
 - 7. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches (100 mm) on either side of where conduit emerges or use PVC-coated galvanized steel rigid metal conduit.
- D. Embedded Within Concrete:
 - 1. Within Slab on Grade (within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 - 2. Within Slab Above Ground (within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 - 3. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from concrete.
- E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.
- I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

- J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
 - 1. Locations subject to physical damage include, but are not limited to:
 - a. Where exposed below 8 feet (2.4 m), except within electrical and communication rooms or closets.
 - b. Where exposed below 20 feet (6.1 m) in warehouse areas.
- K. Exposed, Exterior: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit.
- L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- M. Hazardous (Classified) Locations: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), aluminum rigid metal conduit, or PVC-coated galvanized steel rigid metal conduit.
- N. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
 - 1. Maximum Length: 6 feet (1.8 m).
- O. Connections to Vibrating Equipment:
 - 1. Dry Locations: Use flexible metal conduit.
 - 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
 - 3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.
 - 4. Vibrating equipment includes, but is not limited to:
 - a. Transformers.
 - b. Motors.
- P. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.

2.02 CONDUIT REQUIREMENTS

- A. Electrical Service Conduits: Also comply with Section 262100.
- B. Communications Systems Conduits: Also comply with Section 271000.
- C. Fittings for Grounding and Bonding: Also comply with Section 260526.
- D. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- E. Provide products listed, classified, and labeled as suitable for the purpose intended.
- F. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 1/2 inch (16 mm) trade size.
 - 2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
 - 3. Control Circuits: 1/2 inch (16 mm) trade size.
 - 4. Flexible Connections to Luminaires: 1/2 inch (16 mm) trade size.
 - 5. Underground, Interior: 3/4 inch (21 mm) trade size.
 - 6. Underground, Exterior: 1 inch (27 mm) trade size.
- G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
 - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
 - 3. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
 - 4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 ALUMINUM RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC aluminum rigid metal conduit complying with ANSI C80.5 and listed and labeled as complying with UL 6A.
- B. Fittings:
 - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
 - 3. Material: Use aluminum.
 - 4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.05 INTERMEDIATE METAL CONDUIT (IMC)

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:
 - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
 - 3. Material: Use steel or malleable iron.
 - 4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.06 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.
- B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil (1.02 mm).
- C. PVC-Coated Fittings:
 - 1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
 - 2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
 - 3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
 - 4. Material: Use steel or malleable iron.
 - 5. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil (1.02 mm).
- D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil (0.38 mm).

2.07 FLEXIBLE METAL CONDUIT (FMC)

- A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.

2.08 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.

2.09 ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

- B. Fittings:
 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 2. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
 3. Connectors and Couplings: Use compression (gland) or set-screw type.
 - a. Do not use indenter type connectors and couplings.
 - b. Do not use set-screw type connectors and couplings.
 4. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.
 5. Embedded Within Concrete (where permitted): Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

2.10 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- B. Fittings:
 1. Manufacturer: Same as manufacturer of conduit to be connected.
 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.11 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)

- A. Applications:
 1. Above Ground, Not Subject to Physical Damage: Use aboveground (AG), SW (Standard Wall), HW (Heavy Wall), or XW (Extra Heavy Wall) RTRC.
 2. Above Ground, Subject to Physical Damage: Use aboveground (AG), XW (Extra Heavy Wall) RTRC.
 3. Underground, Direct-Buried: Use belowground (BG), DB (direct burial) RTRC or aboveground (AG) RTRC.
 4. Underground, Embedded in Concrete: Use belowground (BG), EB (encased burial) RTRC, belowground (BG), DB (direct burial) RTRC, or aboveground (AG) RTRC.
 5. Do not use RTRC in hazardous (classified) locations.
- B. Description: NFPA 70, Type RTRC reinforced thermosetting resin conduit complying with NEMA TC 14 (SERIES).
 1. Aboveground (AG) RTRC: Comply with NEMA TC 14.AG and list and label as complying with UL 2515.
 2. Aboveground (AG), XW (Extra Heavy Wall) RTRC: Comply with NEMA TC 14.XW and list and label as complying with UL 2515A.
 3. Belowground (BG) RTRC: Comply with NEMA TC 14.BG and list and label as complying with UL 2420.
- C. Supports: Per manufacturer's recommendations.
- D. Fittings: Same type and manufacturer as conduit to be connected.

2.12 ACCESSORIES

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil (0.51 mm).
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
- C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- D. Epoxy Adhesive for RTRC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- E. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force (890 N).
- F. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.

- G. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.
- H. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.
- I. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
 - 1. Products:
 - a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: www.holdrite.com/#sle.
- J. Duct Bank Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for concrete encasement in open trench installation; suitable for the conduit/duct arrangement to be installed.
- K. Bore Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for installation within casing; furnished with roller wheels to facilitate installation, openings to facilitate grout flow, and holes for stabilization cable; suitable for the casing and conduit/duct arrangement to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install aluminum rigid metal conduit (RMC) in accordance with NECA 102.
- E. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- F. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.
- G. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- H. Install electrical nonmetallic tubing (ENT) in accordance with NECA 111.
- I. Install liquidtight flexible nonmetallic conduit (LFNC) in accordance with NECA 111.
- J. Conduit Routing:
 - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
 - 2. When conduit destination is indicated without specific routing, determine exact routing required.
 - 3. Conceal all conduits unless specifically indicated to be exposed.
 - 4. Conduits in the following areas may be exposed, unless otherwise indicated:
 - a. Electrical rooms.
 - b. Mechanical equipment rooms.
 - c. Within joists in areas with no ceiling.
 - d. Unfinished spaces.
 - 5. Unless otherwise approved, do not route conduits exposed:
 - a. Across floors.
 - b. Across roofs.
 - c. Across top of parapet walls.
 - d. Across building exterior surfaces.
 - 6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where

- practical.
7. Arrange conduit to maintain adequate headroom, clearances, and access.
 8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
 9. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
 10. Route conduits above water and drain piping where possible.
 11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
 12. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
 13. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
 - a. Heaters.
 - b. Hot water piping.
 14. Group parallel conduits in the same area together on a common rack.
- K. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
 3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
 4. Use conduit strap to support single surface-mounted conduit.
 - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
 5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
 6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
 7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
 8. Use of spring steel conduit clips for support of conduits is not permitted.
 9. Use of wire for support of conduits is not permitted.
 10. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.
- L. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 3. Use suitable adapters where required to transition from one type of conduit to another.
 4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
 5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
 7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- M. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 4. Conceal bends for conduit risers emerging above ground.
 5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.

6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
 8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- N. Underground Installation:
1. Provide trenching and backfilling in accordance with Section 312316 and Section 312323.
 2. Minimum Cover, Unless Otherwise Indicated or Required:
 - a. Underground, Exterior: 24 inches (610 mm).
 - b. Under Slab on Grade: 12 inches (300 mm) to bottom of slab.
 3. Provide underground warning tape in accordance with Section 260553 along entire conduit length for service entrance where not concrete-encased.
- O. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
1. Secure conduits to prevent floating or movement during pouring of concrete.
- P. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 033000 with minimum concrete cover of 3 inches (76 mm) on all sides unless otherwise indicated.
- Q. Hazardous (Classified) Locations: Where conduits cross boundaries of hazardous (classified) locations, provide sealing fittings located as indicated or in accordance with NFPA 70.
- R. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
 3. Where calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.
 4. Where conduits are subject to earth movement by settlement or frost.
- S. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
 2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- T. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.
- U. Provide grounding and bonding in accordance with Section 260526.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.
- D. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

- A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION 260533.13

SECTION 260533.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).
- C. Boxes and enclosures for integrated power, data, and audio/video.
- D. Boxes for hazardous (classified) locations.
- E. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete.
- B. Section 078400 - Firestopping.
- C. Section 083100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- D. Section 260526 - Grounding and Bonding for Electrical Systems.
- E. Section 260529 - Hangers and Supports for Electrical Systems.
- F. Section 260533.13 - Conduit for Electrical Systems:
 - 1. Conduit bodies and other fittings.
 - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- G. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- H. Section 262726 - Wiring Devices:
 - 1. Wall plates.
 - 2. Additional requirements for locating boxes for wiring devices.
- I. Section 271000 - Structured Cabling: Additional requirements for communications systems outlet boxes.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2010.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports 2013.
- F. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports 2013 (R2020).
- G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- J. UL 508A - Industrial Control Panels Current Edition, Including All Revisions.
- K. UL 514A - Metallic Outlet Boxes Current Edition, Including All Revisions.
- L. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers Current Edition, Including All Revisions.

- M. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
 4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
 5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
 6. Coordinate the work with other trades to preserve insulation integrity.
 7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
 8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 BOXES

- A. General Requirements:
1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.
 4. Use cast aluminum boxes where aluminum rigid metal conduit is used.
 5. Use nonmetallic boxes where exposed rigid PVC conduit is used.
 6. Use suitable concrete type boxes where flush-mounted in concrete.
 7. Use suitable masonry type boxes where flush-mounted in masonry walls.
 8. Use raised covers suitable for the type of wall construction and device configuration where required.
 9. Use shallow boxes where required by the type of wall construction.
 10. Do not use "through-wall" boxes designed for access from both sides of wall.
 11. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.

12. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
13. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
14. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
15. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
16. Minimum Box Size, Unless Otherwise Indicated:
17. Wall Plates: Comply with Section 262726.
18. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com/#sle.
 - b. Hubbell Incorporated; Bell Products: www.hubbell-rtb.com/#sle.
 - c. Hubbell Incorporated; RACO Products: www.hubbell-rtb.com/#sle.
 - d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - e. Thomas & Betts Corporation: www.tnb.com/#sle.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 2. NEMA 250 Environment Type, Unless Otherwise Indicated:
 - a. Indoor Clean, Dry Locations: Type 1, painted steel.
 - b. Outdoor Locations: Type 3R, painted steel.
 3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
 - b. Boxes 6 square feet (0.56 sq m) and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.
 4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
 - a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
 - b. Back Panels: Painted steel, removable.
 - c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.
 5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
 6. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com/#sle.
 - b. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com/#sle.
 - c. Hubbell Incorporated; Wiegmann Products: www.hubbell-wiegmann.com/#sle.
- D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.
- E. Boxes for Hazardous (Classified) Locations: Listed and labeled as complying with UL 1203 for the classification of the installed location.

2.02 ACCESSORIES

- A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for boxes and facade materials to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.

- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- H. Box Locations:
 - 1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100 as required where approved by the Architect.
 - 2. Unless dimensioned, box locations indicated are approximate.
 - 3. Locate boxes as required for devices installed under other sections or by others.
 - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 262726.
 - b. Communications Systems Outlets: Comply with Section 271000.
 - 4. Locate boxes so that wall plates do not span different building finishes.
 - 5. Locate boxes so that wall plates do not cross masonry joints.
 - 6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
 - 7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
 - 8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) horizontal separation.
 - 9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
 - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
 - b. Do not install flush-mounted boxes with area larger than 16 square inches (0.0103 sq m) or such that the total aggregate area of openings exceeds 100 square inches (0.0645 sq m) for any 100 square feet (9.29 sq m) of wall area.
 - 10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260533.13.
 - 11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
 - a. Concealed above accessible suspended ceilings.
 - b. Within joists in areas with no ceiling.
 - c. Electrical rooms.
 - d. Mechanical equipment rooms.
 - e. Unfinished spaces..
- I. Box Supports:
 - 1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
 - 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
 - 3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
 - 4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.

- J. Install boxes plumb and level.
- K. Flush-Mounted Boxes:
 - 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
 - 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
 - 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.
- L. Install boxes as required to preserve insulation integrity.
- M. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- N. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- O. Close unused box openings.
- P. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- Q. Provide grounding and bonding in accordance with Section 260526.
- R. Identify boxes in accordance with Section 260553.

3.03 CLEANING

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION 260533.16

This page intentionally left blank

SECTION 260553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Underground warning tape.
- F. Floor marking tape.
- G. Warning signs and labels.

1.02 RELATED REQUIREMENTS

- A. Section 099113 - Exterior Painting.
- B. Section 099123 - Interior Painting.
- C. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
- D. Section 262300 - Low-Voltage Switchgear: Factory-installed mimic bus.
- E. Section 262726 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

1.03 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. NFPA 70E - Standard for Electrical Safety in the Workplace 2021.
- C. UL 969 - Marking and Labeling Systems Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
 - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
 - 2. Do not install identification products until final surface finishes and painting are complete.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.06 FIELD CONDITIONS

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

- A. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Switchgear:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.

- b. Switchboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Use identification nameplate to identify main overcurrent protective device.
 - 5) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
- c. Panelboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
 - 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
 - 6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
- d. Transformers:
 - 1) Identify kVA rating.
 - 2) Identify voltage and phase for primary and secondary.
- e. Enclosed switches, circuit breakers, and motor controllers:
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number. Include location when not within sight of equipment.
 - 3) Identify load(s) served. Include location when not within sight of equipment.
- f. Time Switches:
 - 1) Identify load(s) served and associated circuits controlled. Include location.
- g. Enclosed Contactors:
 - 1) Identify voltage and phase.
 - 2) Identify configuration, e.g., E.O.E.H. (electrically operated, electrically held) or E.O.M.H. (electrically operated, mechanically held).
 - 3) Identify coil voltage.
- h. Transfer Switches:
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number for both normal power source and standby power source. Include location when not within sight of equipment.
 - 3) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.
2. Service Equipment:
 - a. Use identification nameplate to identify each service disconnecting means.
3. Use voltage marker to identify highest voltage present for each piece of electrical equipment.
4. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
5. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
6. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
7. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.
 - a. Field-Painted Floor Markings: Alternating black and white stripes, 3 inches (76 mm) wide, painted in accordance with Section 099123 and 099113.
8. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring

documentation by NFPA 70 including but not limited to the following.

- a. Service equipment.
 - b. Industrial control panels.
 - c. Motor control centers.
 - d. Elevator control panels.
 - e. Industrial machinery.
9. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
- a. Minimum Size: 3.5 by 5 inches (89 mm by 127 mm).
 - b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.
 - c. Service Equipment: Include the following information in accordance with NFPA 70.
 - 1) Nominal system voltage.
 - 2) Available fault current.
 - 3) Clearing time of service overcurrent protective device(s).
 - 4) Date label applied.
- B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
 3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
 - a. At each source and load connection.
 - b. Within boxes when more than one circuit is present.
 - c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
 4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.
 5. Use underground warning tape to identify direct buried cables.
- C. Identification for Raceways:
1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet (6.1 m).
 2. Use voltage markers or color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet (6.1 m).
 - a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches (76 mm) wide.
 - 1) Color Code:
 - (a) Fire Alarm System: Red.
 - 2) Field-Painting: Comply with Section 099123 and 099113.
 - 3) Vinyl Color Coding Electrical Tape: Comply with Section 260519.
 3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.
 4. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
 5. Use underground warning tape to identify underground raceways.
 6. Use voltage markers to identify highest voltage present for wireways at maximum intervals of 20 feet (6.1 m).
- D. Identification for Boxes:

1. Use voltage markers to identify highest voltage present.
 2. Use voltage markers or color coded boxes to identify systems other than normal power system.
 - a. Color-Coded Boxes: Field-painted in accordance with Section 099123 and 099113 per the same color code used for raceways.
 - 1) Fire Alarm System: Red.
 3. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
- E. Identification for Devices:
1. Wiring Device and Wallplate Finishes: Comply with Section 262726.
 2. Use identification label to identify fire alarm system devices.
 - a. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.
 3. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
 - a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.
 4. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
1. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
 2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
 3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
 4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
 5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.
- B. Identification Labels:
1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for Equipment Identification:
1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
 2. Legend:
 - a. Equipment designation or other approved description.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height:
 - a. Equipment Designation: 1/2 inch (13 mm).
 5. Color:
 - a. Normal Power System: White text on black background.
 - b. Fire Alarm System: White text on red background.
- D. Format for General Information and Operating Instructions:
1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 1/4 inch (6 mm).
 5. Color: Black text on white background unless otherwise indicated.

- E. Format for Caution and Warning Messages:
 - 1. Minimum Size: 2 inches (51 mm) by 4 inches (100 mm).
 - 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 1/2 inch (13 mm).
 - 5. Color: Black text on yellow background unless otherwise indicated.
- F. Format for Receptacle Identification:
 - 1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
 - 2. Legend: Power source and circuit number or other designation indicated.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 3/16 inch (5 mm).
 - 5. Color: Black text on clear background.
- G. Format for Control Device Identification:
 - 1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
 - 2. Legend: Load controlled or other designation indicated.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 3/16 inch (5 mm).
 - 5. Color: Black text on clear background.
- H. Format for Fire Alarm Device Identification:
 - 1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
 - 2. Legend: Designation indicated and device zone or address.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 3/16 inch (5 mm).
 - 5. Color: Red text on white background.

2.03 WIRE AND CABLE MARKERS

- A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- C. Legend: Power source and circuit number or other designation indicated.
- D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- E. Minimum Text Height: 1/8 inch (3 mm).
- F. Color: Black text on white background unless otherwise indicated.

2.04 VOLTAGE MARKERS

- A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.
- B. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- C. Minimum Size:
 - 1. Markers for Equipment: 1 1/8 by 4 1/2 inches (29 by 110 mm).
 - 2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
 - 3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches (29 by 110 mm).
 - 4. Markers for Junction Boxes: 1/2 by 2 1/4 inches (13 by 57 mm).
- D. Legend:
 - 1. Markers for Voltage Identification: Highest voltage present.
 - 2. Markers for System Identification:
- E. Color: Black text on orange background unless otherwise indicated.

2.05 UNDERGROUND WARNING TAPE

- A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- B. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).
- C. Legend: Type of service, continuously repeated over full length of tape.
- D. Color:

2.06 FLOOR MARKING TAPE

- A. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlamine, 3 inches (76 mm) wide, with alternating black and white stripes.

2.07 WARNING SIGNS AND LABELS

- A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- B. Warning Signs:
 - 1. Materials:
 - 2. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.
- C. Warning Labels:
 - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 - 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
 - 3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 - 1. Surface-Mounted Equipment: Enclosure front.
 - 2. Flush-Mounted Equipment: Inside of equipment door.
 - 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 - 4. Elevated Equipment: Legible from the floor or working platform.
 - 5. Branch Devices: Adjacent to device.
 - 6. Interior Components: Legible from the point of access.
 - 7. Conduits: Legible from the floor.
 - 8. Boxes: Outside face of cover.
 - 9. Conductors and Cables: Legible from the point of access.
 - 10. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.
- G. Mark all handwritten text, where permitted, to be neat and legible.

3.02 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION 260553

SECTION 260583 WIRING CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 260533.13 - Conduit for Electrical Systems.
- C. Section 260533.16 - Boxes for Electrical Systems.
- D. Section 262726 - Wiring Devices.
- E. Section 262816.16 - Enclosed Switches.

1.03 REFERENCE STANDARDS

- A. NEMA WD 1 - General Color Requirements for Wiring Devices 1999 (Reaffirmed 2015).
- B. NEMA WD 6 - Wiring Devices - Dimensional Specifications 2016.
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
 - 2. Determine connection locations and requirements.
- B. Sequencing:
 - 1. Install rough-in of electrical connections before installation of equipment is required.
 - 2. Make electrical connections before required start-up of equipment.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
 - 1. Colors: Comply with NEMA WD 1.
 - 2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
 - 3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
- B. Disconnect Switches: As specified in Section 262816.16 and in individual equipment sections.
- C. Wiring Devices: As specified in Section 262726.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION 260583

SECTION 262100
LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical service requirements.

1.02 RELATED REQUIREMENTS

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260533.13 - Conduit for Electrical Systems.
- E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 262300 - Low-Voltage Switchgear: Service entrance equipment.
- G. Section 262413 - Switchboards: Service entrance equipment.
- H. Section 262816.16 - Enclosed Switches: Service entrance equipment.
- I. Section 263213 - Engine Generators: Emergency/standby power systems for interconnection with normal utility electrical supply.
- J. Section 263600 - Transfer Switches: Service entrance equipment.
- K. Section 312316 - Excavation.
- L. Section 312323 - Fill: Bedding and backfilling.

1.03 PRICE AND PAYMENT PROCEDURES

- A. Allowances:
 - 1. See Section 012100 - Allowances, for allowances affecting this section.

1.04 REFERENCE STANDARDS

- A. IEEE C2 - National Electrical Safety Code 2017.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.
- B. Coordination:
 - 1. Verify the following with Utility Company representative:
 - a. Utility Company requirements, including division of responsibility.
 - b. Exact location and details of utility point of connection.
 - c. Utility easement requirements.
 - d. Utility Company charges associated with providing service.
 - 2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.
 - 3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- C. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.
- D. Utility Company charges associated with providing permanent service to be paid by Owner.
- E. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.
- F. Scheduling:

1. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.06 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Project Record Documents: Record actual locations of equipment and installed service routing.

1.07 QUALITY ASSURANCE

- A. Comply with the following:
 1. IEEE C2 (National Electrical Safety Code).
 2. NFPA 70 (National Electrical Code).
 3. The requirements of the Utility Company.
 4. The requirements of the local authorities having jurisdiction.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- B. Store products indoors in a clean, dry space having a uniform temperature to prevent condensation (including outdoor rated products which are not weatherproof until completely and properly installed). Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle products carefully to avoid damage to internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 ELECTRICAL SERVICE REQUIREMENTS

- A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.
- B. Electrical Service Characteristics:
 1. Service Type: Underground.
 2. Service Voltage: 480Y/277 V, 3 phase, 60 Hz.
- C. Division of Responsibility: As indicated on drawings.
- D. Products Furnished by Contractor: Comply with Utility Company requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Verify and mark locations of existing underground utilities.

3.03 INSTALLATION

- A. Install products in accordance with manufacturer's instructions and Utility Company requirements.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances and required maintenance access.
- D. Provide required trenching and backfilling in accordance with Section 312316 and Section 312323.
- E. Provide required protective bollards in accordance with Utility Company requirements.
- F. Provide required support and attachment components in accordance with Section 260529.
- G. Provide grounding and bonding for service entrance equipment in accordance with Section 260526.

- H. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 260553.

3.04 PROTECTION

- A. Protect installed equipment from subsequent construction operations.

END OF SECTION 262100

This page intentionally left blank

SECTION 262200
LOW-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General purpose transformers.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260533.13 - Conduit for Electrical Systems: Flexible conduit connections.
- E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 262416 - Panelboards.

1.03 REFERENCE STANDARDS

- A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers Current Edition.
- B. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers 2015.
- C. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers 2013.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- E. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers 2015.
- F. NEMA ST 20 - Dry-Type Transformers for General Applications 2014.
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- I. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 506 - Standard for Specialty Transformers Current Edition, Including All Revisions.
- K. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate the work with placement of supports, anchors, etc. required for mounting.
 - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point dimensions, weight, required clearances, service condition requirements, and installed features.

- C. Shop Drawings: Provide dimensioned plan and elevation views of transformers and adjacent equipment with all required clearances indicated.
- D. Project Record Documents: Record actual locations of transformers.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ABB/GE: www.electrification.us.abb.com/#sle.
- B. Eaton Corporation: www.eaton.com/#sle.
- C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
- D. Siemens Industry, Inc: www.usa.siemens.com/#sle.

2.02 TRANSFORMERS - GENERAL REQUIREMENTS

- A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.
- B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:
 - 1. Altitude: Less than 3,300 feet (1,000 m).
 - 2. Ambient Temperature:
 - a. Greater than 10 kVA: Not exceeding 120 degrees F (40 degrees C).
 - b. Less than 10 kVA: Not exceeding 77 degrees F (25 degrees C).
- C. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.
- D. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.
- E. Basic Impulse Level: 10 kV.
- F. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
- G. Isolate core and coil from enclosure using vibration-absorbing mounts.
- H. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

2.03 GENERAL PURPOSE TRANSFORMERS

- A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.
- B. Insulation System and Allowable Average Winding Temperature Rise:
 - 1. Less than 15 kVA: Class 180 degrees C insulation system with 115 degrees C average winding temperature rise.

2. 15 kVA and Larger: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.
- C. Coil Conductors: Continuous aluminum windings with terminations brazed or welded.
- D. Winding Taps:
 1. Less than 3 kVA: None.
 2. 3 kVA through 15 kVA: Two 5 percent full capacity primary taps below rated voltage.
 3. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.
 4. 500 kVA and Larger: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.
- E. Energy Efficiency: Comply with 10 CFR 431, Subpart K.
- F. Sound Levels: Standard sound levels complying with NEMA ST 20
- G. Mounting Provisions:
 1. Less than 15 kVA: Suitable for wall mounting.
 2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.
 3. Larger than 75 kVA: Suitable for floor mounting.
- H. Transformer Enclosure: Comply with NEMA ST 20.
 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 2. Construction: Steel.
 - a. Less than 15 kVA: Totally enclosed, non-ventilated.
 - b. 15 kVA and Larger: Ventilated.
 3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
 4. Provide lifting eyes or brackets.

2.04 SOURCE QUALITY CONTROL

- A. Factory test transformers according to NEMA ST 20.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that suitable support frames and anchors are installed where required and that mounting surfaces are ready to receive transformers.
- C. Perform pre-installation tests and inspections on transformers per manufacturer's instructions and as specified in NECA 409. Correct deficiencies prior to installation.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install transformers in accordance with NECA 409 and IEEE C57.94.
- D. Use flexible conduit, under the provisions of Section 260533.13, 2 feet (600 mm) minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.
- E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.
- F. Install transformers plumb and level.
- G. Transformer Support:
 1. Provide required support and attachment in accordance with Section 260529, where not furnished by transformer manufacturer.
 2. Use integral transformer flanges, accessory brackets furnished by manufacturer, or field-fabricated supports to support wall-mounted transformers.
 3. Unless otherwise indicated, mount floor-mounted transformers on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 033000.

- 4. Use trapeze hangers assembled from threaded rods and metal channel (strut) to support suspended transformers. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- H. Provide grounding and bonding in accordance with Section 260526.
- I. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.
- J. Where not factory-installed, install lugs sized as required for termination of conductors as indicated.
- K. Identify transformers in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS Sections 7.2.1.1 and 7.2.1.2. Tests and inspections listed as optional are not required.

3.04 ADJUSTING

- A. Measure primary and secondary voltages and make appropriate tap adjustments.
- B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

- A. Clean dirt and debris from transformer components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 262200

**SECTION 262300
LOW-VOLTAGE SWITCHGEAR**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Low-voltage (600 V and less) standard (non-arc-resistant) metal-enclosed drawout switchgear and accessories for service and distribution applications.
- B. Low-voltage power circuit breakers for switchgear.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 260573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.
- F. Section 262100 - Low-Voltage Electrical Service Entrance.
- G. Section 262413 - Switchboards.
- H. Section 262813 - Fuses: Fuses for fusible switches.

1.03 REFERENCE STANDARDS

- A. ANSI C37.50 - American National Standard for Switchgear - Low-Voltage AC Power Circuit Breakers Used in Enclosures - Test Procedures 2012.
- B. ANSI C37.51 - American National Standard for Switchgear - Metal-Enclosed Low-Voltage AC Power Circuit Breaker Switchgear Assemblies - Conformance Test Procedures 2003 (R2010), with Amendment 1, 2010.
- C. IEEE C37.13 - IEEE Standard for Low-Voltage AC Power Circuit Breakers Used in Enclosures 2015.
- D. IEEE C37.16 - IEEE Standard for Preferred Ratings, Related Requirements, and Application Recommendations for Low-Voltage AC (635 V and below) and DC (3200 V and below) Power Circuit Breakers 2009.
- E. IEEE C37.17 - IEEE Standard for Trip Systems for Low-Voltage (1000 V and below) AC and General Purpose (1500 V and below) DC Power Circuit Breakers 2012.
- F. IEEE C37.20.1 - IEEE Standard for Metal-Enclosed Low-Voltage (1000 Vac and below, 3200 Vdc and below) Power Circuit Breaker Switchgear 2015.
- G. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers 2016.
- H. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- I. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- J. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- K. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 869A - Reference Standard for Service Equipment Current Edition, Including All Revisions.
- M. UL 1053 - Ground-Fault Sensing and Relaying Equipment Current Edition, Including All Revisions.
- N. UL 1066 - Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures Current Edition, Including All Revisions.
- O. UL 1558 - Switchgear Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 4. Coordinate with manufacturer to provide shipping splits suitable for the dimensional constraints of the installation.
 5. Notify Architect of any conflicts with or deviations Contract Documents. Obtain direction before proceeding with work.
- B. Service Entrance Switchgear:
1. Coordinate with Utility Company to provide switchgear with suitable provisions for electrical service and utility metering, where applicable.
 2. Coordinate with Owner to arrange for Utility Company required access to equipment for installation and maintenance.
 3. Obtain Utility Company approval of switchgear prior to fabrication.
 4. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for switchgear, enclosures, overcurrent protective devices, and other installed components and accessories.
1. Include characteristic trip curves for each type and rating of overcurrent protective device.
- C. Shop Drawings: Indicate dimensions, voltage, bus ampacities, overcurrent protective device arrangement and sizes, short circuit current ratings, short-time current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
1. Include dimensioned plan and elevation views of switchgear and adjacent equipment with all required clearances indicated.
 2. Include wiring diagrams showing all factory and field connections.
 3. Include documentation demonstrating selective coordination upon request.
- D. Project Record Documents: Record actual installed locations of switchgear and final equipment settings.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store switchgear in accordance with manufacturer's instructions and IEEE C37.20.1.
- B. Store in a clean, dry space having a uniform temperature to prevent condensation (including outdoor switchgear, which is not weatherproof until completely and properly installed). Where necessary, provide temporary enclosure space heaters or temporary power for permanent factory-installed space heaters.
- C. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- D. Handle carefully to avoid damage to switchgear internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Low-Voltage Switchgear - Basis of Design: Square D I-Line Series.

- B. Low-Voltage Switchgear - Other Acceptable Manufacturers:
 - 1. ABB/GE: www.electrification.us.abb.com/#sle.
 - 2. Eaton Corporation: www.eaton.com/#sle.
 - 3. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
 - 4. Siemens Industry, Inc: www.usa.siemens.com/#sle.
- C. Substitutions: See Section 016000 - Product Requirements.
- D. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.
- E. Source Limitations: Furnish switchgear and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 LOW-VOLTAGE SWITCHGEAR

- A. Provide switchgear assemblies consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Description: Dead-front standard (non-arc-resistant) type metal-enclosed drawout switchgear complying with IEEE C37.20.1 and ANSI C37.51; listed and labeled as complying with UL 1558; ratings, configurations and features as indicated on the drawings.
- D. Service Conditions:
 - 1. Provide switchgear and associated components suitable for operation under the following service conditions without derating:
 - a. Altitude: Less than 6,600 feet (2,000 m).
 - b. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).
 - 2. Provide switchgear and associated components suitable for operation at indicated ratings under the service conditions at the installed location.
- E. Short Circuit Current Rating:
 - 1. Provide switchgear with listed short circuit rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.
- F. Short-Time Current (30-Cycle Withstand) Rating: Equivalent to specified short circuit current rating.
- G. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.
- H. Main Devices: Configure for top or bottom incoming feed as indicated or as required for the installation. Provide top-mounted pullbox as indicated or as required to facilitate installation of incoming feed.
- I. Bussing: Sized in accordance with UL 1558 temperature rise requirements.
 - 1. Main bus (horizontal cross bus) to be fully rated through full length of switchgear.
 - 2. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
 - 3. Provide solidly bonded equipment ground bus through full length of switchgear, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
 - 4. Phase and Neutral Bus Material: Copper.
 - 5. Ground Bus Material: Copper.
- J. Conductor Terminations: Suitable for use with the conductors to be installed.
 - 1. Line Conductor Terminations:
 - a. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - b. Main and Neutral Lug Type: Mechanical.
 - 2. Load Conductor Terminations:
 - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

- b. Lug Type:
 - 1) Provide mechanical lugs unless otherwise indicated.
- K. Enclosures:
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
 - 2. Finish: Manufacturer's standard unless otherwise indicated.
 - 3. Outdoor Enclosures:
 - a. Enclosure Type: Non-walk-in type unless otherwise indicated.
 - b. Color: Manufacturer's standard.
 - c. Access Doors: Lockable, with all locks keyed alike.
- L. Future Provisions:
 - 1. Prepare designated spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- M. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
- N. Arc Flash Energy-Reducing Maintenance Switching: For circuit breakers rated 1200 A or higher, provide a local accessory switch with status indicator light that permits selection of a maintenance mode with alternate electronic trip unit settings for reduced fault clearing time.
- O. Instrument Transformers:
 - 1. Comply with IEEE C57.13.
 - 2. Select suitable ratio, burden, and accuracy as required for connected devices.
 - 3. Current Transformers: Connect secondaries to shorting terminal blocks.
 - 4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

2.03 LOW-VOLTAGE POWER CIRCUIT BREAKERS

- A. Description: Quick-make, quick-break, trip-free low-voltage power circuit breakers with two-step stored energy closing mechanism; 100 percent rated; complying with IEEE C37.13, IEEE C37.16, IEEE C37.17, and ANSI C37.50; listed and labeled as complying with UL 1066; ratings, configurations, and features as indicated on the drawings.
- B. Interrupting Capacity: Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated.
- C. Construction: Drawout.
 - 1. Allows withdrawal of circuit breaker into test and disconnected positions, with racking position indication (connected, test, disconnected, withdrawn).
 - 2. Provide safety interlock to prevent racking of circuit breaker while in the ON position.
- D. Trip Units: Solid state, microprocessor-based, true rms sensing.

2.04 SOURCE QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Factory test switchgear according to IEEE C37.20.1, including the following production tests on each switchgear assembly or component:
 - 1. Dielectric tests.
 - 2. Mechanical operation tests.
 - 3. Grounding of instrument transformer cases test.
 - 4. Electrical operation and control wiring tests, including polarity and sequence tests.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the switchgear and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive switchgear.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install switchgear in accordance with NECA 1 (general workmanship) and IEEE C37.20.1.
- C. Arrange equipment to provide required clearances and maintenance access, including accommodations for drawout circuit breakers.
- D. Provide required support and attachment in accordance with Section 260529.
- E. Install switchgear plumb and level.
- F. Unless otherwise indicated, mount switchgear on properly sized 4 inch (100 mm) high concrete pad constructed in accordance with Section 033000.
- G. Provide grounding and bonding in accordance with Section 260526.
- H. Install all field-installed devices, components, and accessories.
- I. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- J. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed in accordance with Section 260573.
- K. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Before energizing switchgear, perform preoperation checks in accordance with IEEE C37.20.1.
- C. Inspect and test in accordance with NETA ATS, except Section 4.
- D. Perform inspections and tests listed in NETA ATS, Section 7.1.
- E. Low-Voltage Power Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.2 for all main circuit breakers. Tests listed as optional are not required.
- F. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
 - 1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.
- G. Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10. The dielectric withstand tests on primary windings with secondary windings connected to ground listed as optional are not required.
- H. Correct deficiencies and replace damaged or defective switchgear assemblies or associated components.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of switchgear covers and doors.

3.05 CLEANING

- A. Clean dirt and debris from switchgear enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred surfaces to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 017800 - Closeout Submittals, for closeout submittals.
- B. See Section 017900 - Demonstration and Training, for additional requirements.
- C. Training: Train Owner's personnel on operation, adjustment, and maintenance of switchgear and associated devices.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

3.07 PROTECTION

- A. Protect installed switchgear assemblies from subsequent construction operations.

END OF SECTION 262300

SECTION 262413 SWITCHBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Low-voltage (600 V and less) switchboards and associated accessories for service and distribution applications.
- B. Overcurrent protective devices for switchboards.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 260573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.
- F. Section 262100 - Low-Voltage Electrical Service Entrance.
- G. Section 262300 - Low-Voltage Switchgear.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service 2013e (Amended 2017).
- B. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers 2016.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- D. NECA 400 - Standard for Installing and Maintaining Switchboards 2007.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- F. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum) 2013.
- G. NEMA PB 2 - Deadfront Distribution Switchboards 2011.
- H. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less 2013.
- I. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- J. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL 98 - Enclosed and Dead-Front Switches Current Edition, Including All Revisions.
- L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.
- M. UL 891 - Switchboards Current Edition, Including All Revisions.
- N. UL 1053 - Ground-Fault Sensing and Relaying Equipment Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 4. Coordinate with manufacturer to provide shipping splits suitable for the dimensional constraints of the installation.

5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for switchboards, enclosures, overcurrent protective devices, and other installed components and accessories.
 1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.
- C. Shop Drawings: Indicate dimensions, voltage, bus ampacities, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 1. Include wiring diagrams showing all factory and field connections.
 2. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
 3. Include documentation demonstrating selective coordination upon request.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store switchboards in accordance with manufacturer's instructions, NECA 400, and NEMA PB 2.1.
- B. Store in a clean, dry space having a uniform temperature to prevent condensation (including outdoor switchboards, which are not weatherproof until completely and properly installed). Where necessary, provide temporary enclosure space heaters or temporary power for permanent factory-installed space heaters.
- C. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- D. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.01 SWITCHBOARDS

- A. Provide switchboards consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Description: Dead-front switchboard assemblies complying with NEMA PB 2, and listed and labeled as complying with UL 891; ratings, configurations and features as indicated on the drawings.
- D. Service Conditions:
 1. Provide switchboards and associated components suitable for operation under the following service conditions without derating:
 - a. Altitude: Less than 6,600 feet (2,000 m).
 - b. Ambient Temperature:
 - 1) Switchboards Containing Molded Case or Insulated Case Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
 2. Provide switchboards and associated components suitable for operation at indicated ratings under the service conditions at the installed location.
- E. Short Circuit Current Rating:

1. Provide switchboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.
- F. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.
- G. Main Devices: Configure for top or bottom incoming feed as indicated or as required for the installation. Provide separate pull section and/or top-mounted pullbox as indicated or as required to facilitate installation of incoming feed.
- H. Bussing: Sized in accordance with UL 891 temperature rise requirements.
 1. Through bus (horizontal cross bus) to be fully rated through full length of switchboard (non-tapered). Tapered bus is not permitted.
 2. Provide solidly bonded equipment ground bus through full length of switchboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
 3. Phase and Neutral Bus Material: Aluminum.
 4. Ground Bus Material: Aluminum.
- I. Conductor Terminations: Suitable for use with the conductors to be installed.
 1. Line Conductor Terminations:
 - a. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - b. Main and Neutral Lug Type: Mechanical.
 2. Load Conductor Terminations:
 - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - b. Lug Type:
- J. Enclosures:
 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 2. Finish: Manufacturer's standard unless otherwise indicated.
- K. Future Provisions:
 1. Prepare designated spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- L. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
 1. Where overcurrent protective devices equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
- M. Arc Flash Energy-Reducing Maintenance Switching: For circuit breakers rated 1200 A or higher, provide a local accessory switch with status indicator light that permits selection of a maintenance mode with alternate electronic trip unit settings for reduced fault clearing time.
- N. Instrument Transformers:
 1. Comply with IEEE C57.13.
 2. Select suitable ratio, burden, and accuracy as required for connected devices.
 3. Current Transformers: Connect secondaries to shorting terminal blocks.
 4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

2.02 OVERCURRENT PROTECTIVE DEVICES

- A. Circuit Breakers:
 1. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
 - c. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.
 2. Molded Case Circuit Breakers:
 - a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489, and complying with

FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

- 1) Provide thermal magnetic circuit breakers unless otherwise indicated.
- b. Minimum Interrupting Capacity:
 - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
 - 2) 14,000 rms symmetrical amperes at 480 VAC.
- c. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

2.03 SOURCE QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Factory test switchboards according to NEMA PB 2, including the following production (routine) tests on each switchboard assembly or component:
 1. Dielectric tests.
 2. Mechanical operation tests.
 3. Grounding of instrument transformer cases test.
 4. Electrical operation and control wiring tests, including polarity and sequence tests.
 5. Ground-fault sensing equipment test.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the switchboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive switchboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install switchboards in accordance with NECA 1 (general workmanship), NECA 400, and NEMA PB 2.1.
- C. Arrange equipment to provide required clearances and maintenance access, including accommodations for any drawout devices.
- D. Where switchboard is indicated to be mounted with inaccessible side against wall, provide minimum clearance of 1/2 inch (10 mm) between switchboard and wall.
- E. Provide required support and attachment in accordance with Section 260529.
- F. Install switchboards plumb and level.
- G. Unless otherwise indicated, mount switchboards on properly sized 4 inch (100 mm) high concrete pad constructed in accordance with Section 033000.
- H. Provide grounding and bonding in accordance with Section 260526.
- I. Install all field-installed devices, components, and accessories.
- J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- K. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed in accordance with Section 260573.
- L. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
- M. Provide filler plates to cover unused spaces in switchboards.
- N. Identify switchboards in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Provide services of a manufacturer's authorized representative to observe installation and assist in inspection and testing. Include manufacturer's reports with submittals.

- C. Before energizing switchboard, perform insulation resistance testing in accordance with NECA 400 and NEMA PB 2.1.
- D. Inspect and test in accordance with NETA ATS, except Section 4.
- E. Perform inspections and tests listed in NETA ATS, Section 7.1.
- F. Molded Case and Insulated Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers. Tests listed as optional are not required.
- G. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
 - 1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.
- H. Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10. The dielectric withstand tests on primary windings with secondary windings connected to ground listed as optional are not required.
- I. Correct deficiencies and replace damaged or defective switchboards or associated components.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of switchboard covers and doors.

3.05 CLEANING

- A. Clean dirt and debris from switchboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred surfaces to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 017800 - Closeout Submittals, for closeout submittals.

3.07 PROTECTION

- A. Protect installed switchboards from subsequent construction operations.

END OF SECTION 262413

This page intentionally left blank

SECTION 262416 PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.
- C. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 260573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.
- E. Section 262200 - Low-Voltage Transformers: Small power centers with integral primary breaker, transformer, and panelboard.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service 2013e (Amended 2017).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards 2015.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- E. NEMA PB 1 - Panelboards 2011.
- F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less 2013.
- G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- H. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- K. UL 67 - Panelboards Current Edition, Including All Revisions.
- L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.
- M. UL 943 - Ground-Fault Circuit-Interrupters Current Edition, Including All Revisions.
- N. UL 1053 - Ground-Fault Sensing and Relaying Equipment Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
 - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
 1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 1. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
 1. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ABB/GE: www.electrification.us.abb.com/#sle.
- B. Eaton Corporation: www.eaton.com/#sle.
- C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
- D. Siemens Industry, Inc: www.usa.siemens.com/#sle.
- E. Substitutions: See Section 016000 - Product Requirements.
- F. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 1. Altitude: Less than 6,600 feet (2,000 m).
 2. Ambient Temperature:
 - a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
- C. Short Circuit Current Rating:
 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in

- accordance with Section 260573.
- 2. Label equipment utilizing series ratings as required by NFPA 70.
- D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
 - 1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
 - 2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
- H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
 - c. Terminal building: Type 3R.
 - 2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 - b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
 - 3. Fronts:
 - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
 - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
 - c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
 - 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- J. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
 - 1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
 - 2. Where accessory ground fault sensing and relaying equipment is used, equip companion overcurrent protective devices with ground-fault shunt trips.
 - a. Use zero sequence ground fault detection method unless otherwise indicated.
 - b. Provide test panel and field-adjustable ground fault pick-up and delay settings.
- K. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.
- L. Load centers are not acceptable.

2.03 POWER DISTRIBUTION PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
 - 1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
 - 1. Phase and Neutral Bus Material: Aluminum.
 - 2. Ground Bus Material: Aluminum.
- D. Circuit Breakers:
 - 1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.

- E. Enclosures:
 - 1. Provide surface-mounted enclosures unless otherwise indicated.
 - 2. Fronts: Provide trims to cover access to load terminals, wiring gutters, and other live parts, with exposed access to overcurrent protective device handles.
 - 3. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
 - 4. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 LIGHTING AND APPLIANCE PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
 - 1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
 - 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
 - 2. Phase and Neutral Bus Material: Aluminum.
 - 3. Ground Bus Material: Aluminum.
- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- E. Enclosures:
 - 1. Provide surface-mounted or flush-mounted enclosures as indicated.
 - 2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
 - 3. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
 - 4. Provide clear plastic circuit directory holder mounted on inside of door.

2.05 OVERCURRENT PROTECTIVE DEVICES

- A. Molded Case Circuit Breakers:
 - 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
 - 2. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
 - 3. Conductor Terminations:
 - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
 - 5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
 - 6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
 - 7. Provide the following circuit breaker types where indicated:
 - a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
 - b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
 - c. Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.

8. Do not use tandem circuit breakers.
9. Do not use handle ties in lieu of multi-pole circuit breakers.
10. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
11. Provide the following features and accessories where indicated or where required to complete installation:
 - a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

2.06 SOURCE QUALITY CONTROL

- A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required support and attachment in accordance with Section 260529.
- F. Install panelboards plumb.
- G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.
- I. Provide minimum of six spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- J. Provide grounding and bonding in accordance with Section 260526.
- K. Install all field-installed branch devices, components, and accessories.
- L. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
- M. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 260573.
- N. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
- O. Provide filler plates to cover unused spaces in panelboards.
- P. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
 1. Fire detection and alarm circuits.
 2. Communications equipment circuits.
 3. Intrusion detection and access control system circuits.
 4. Video surveillance system circuits.
- Q. Identify panelboards in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.

- C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers. Tests listed as optional are not required.
- D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
- E. Test GFCI circuit breakers to verify proper operation.
- F. Test shunt trips to verify proper operation.
- G. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.
- C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.05 CLEANING

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 262416

SECTION 262726 WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall switches.
- B. Wall dimmers.
- C. Receptacles.
- D. Wall plates.

1.02 RELATED REQUIREMENTS

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260533.16 - Boxes for Electrical Systems.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 260583 - Wiring Connections: Cords and plugs for equipment.

1.03 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for 2017h.
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification) 2017g.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2010.
- E. NEMA WD 1 - General Color Requirements for Wiring Devices 1999 (Reaffirmed 2015).
- F. NEMA WD 6 - Wiring Devices - Dimensional Specifications 2016.
- G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 20 - General-Use Snap Switches Current Edition, Including All Revisions.
- I. UL 498 - Attachment Plugs and Receptacles Current Edition, Including All Revisions.
- J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices Current Edition, Including All Revisions.
- K. UL 943 - Ground-Fault Circuit-Interrupters Current Edition, Including All Revisions.
- L. UL 1472 - Solid-State Dimming Controls Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
 - 3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
 - 4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
 - 5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.
- B. Sequencing:
 - 1. Do not install wiring devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
- C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
- D. Provide GFCI protection for receptacles installed within 6 feet (1.8 m) of sinks.
- E. Provide GFCI protection for receptacles installed in kitchens.
- F. Provide GFCI protection for receptacles serving electric drinking fountains.
- G. Unless noted otherwise, do not use combination switch/receptacle devices.

2.02 WIRING DEVICE FINISHES

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices Installed in Finished Spaces: White with white nylon wall plate.
- C. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.
- D. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover.
- E. Coordinate device and coverplate colors with owner prior to installation..

2.03 WALL SWITCHES

- A. Manufacturers:
 - 1. Hubbell Incorporated: www.hubbell.com/#sle.
 - 2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
 - 3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
- B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
- C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.
- D. Lighted Wall Switches: Industrial specification grade, 20 A, 120/277 V with illuminated standard toggle type switch actuator and maintained contacts; illuminated with load off; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.
- E. Momentary Contact Wall Switches: Industrial specification grade, 20 A, 120/277 V with toggle type three position switch actuator and momentary contacts; single pole double throw, off with switch actuator in center position.

2.04 WALL DIMMERS

- A. Manufacturers:
 - 1. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
 - 2. Lutron Electronics Company, Inc; Maestro Series: www.lutron.com/#sle.

3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
 4. Sensorswitch
- B. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.
- C. Control: Slide control type with separate on/off switch.

2.05 RECEPTACLES

- A. Manufacturers:
1. Hubbell Incorporated: www.hubbell.com/#sle.
 2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
 3. Lutron Electronics Company, Inc; Designer Style: www.lutron.com/#sle.
 4. Substitutions: See Section 016000 - Product Requirements.
 5. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.
- B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
 2. NEMA configurations specified are according to NEMA WD 6.
- C. Convenience Receptacles:
1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
 2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
- D. GFCI Receptacles:
1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
 - a. Provide test and reset buttons of same color as device.
 2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
 3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

2.06 WALL PLATES

- A. Manufacturers:
1. Hubbell Incorporated: www.hubbell-wiring.com/#sle.
 2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
 3. Lutron Electronics Company, Inc: www.lutron.com/#sle.
 4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
 5. Substitutions: See Section 016000 - Product Requirements.
 6. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.
- B. Wall Plates: Comply with UL 514D.
1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
 2. Size: Standard.
 3. Screws: Metal with slotted heads finished to match wall plate finish.

- C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.
- D. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.
- E. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.
- F. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- F. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of wiring devices provided under this section.
 - 1. Mounting Heights: Unless otherwise indicated, as follows:
 - a. Wall Switches: 48 inches (1200 mm) above finished floor.
 - b. Wall Dimmers: 48 inches (1200 mm) above finished floor.
 - c. Receptacles: 18 inches (450 mm) above finished floor or 6 inches (150 mm) above counter.
 - 2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
 - 3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
 - 4. Locate wall switches on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
 - 5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

- H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
- I. Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.
- J. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- K. Install wall switches with OFF position down.
- L. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- M. Do not share neutral conductor on branch circuits utilizing wall dimmers.
- N. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- O. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- P. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- Q. Identify wiring devices in accordance with Section 260553.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- D. Test each receptacle to verify operation and proper polarity.
- E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Architect.

3.06 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION 262726

This page intentionally left blank

SECTION 262813 FUSES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fuses.

1.02 RELATED REQUIREMENTS

- A. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- B. Section 260573 - Power System Studies: Additional criteria for the selection of protective devices specified in this section.
- C. Section 262416 - Panelboards: Fusible switches.
- D. Section 262816.16 - Enclosed Switches: Fusible switches.
- E. Section 262913 - Enclosed Controllers: Fusible switches.

1.03 REFERENCE STANDARDS

- A. NEMA FU 1 - Low Voltage Cartridge Fuses 2012.
- B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements Current Edition, Including All Revisions.
- D. UL 248-4 - Low-Voltage Fuses - Part 4: Class CC Fuses Current Edition, Including All Revisions.
- E. UL 248-8 - Low-Voltage Fuses - Part 8: Class J Fuses Current Edition, Including All Revisions.
- F. UL 248-10 - Low-Voltage Fuses - Part 10: Class L Fuses Current Edition, Including All Revisions.
- G. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses Current Edition, Including All Revisions.
- H. UL 248-15 - Low-Voltage Fuses - Part 15: Class T Fuses Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
 - a. Fusible Enclosed Switches: See Section 262816.16.
 - 2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
 - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Bussmann, a division of Eaton Corporation: www.cooperindustries.com/#sle.
- B. Littelfuse, Inc: www.littelfuse.com/#sle.
- C. Mersen: ep-us.mersen.com/#sle.

2.02 APPLICATIONS

- A. Feeders:
 - 1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.
- B. General Purpose Branch Circuits: Class RK1, time-delay.

- C. Individual Motor Branch Circuits: Class RK1, time-delay.
- D. In-Line Protection for Pole-Mounted Luminaires: Class CC, time-delay.
- E. Primary Protection for Control Transformers: Class CC, time-delay.

2.03 FUSES

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.
- C. Provide fuses of the same type, rating, and manufacturer within the same switch.
- D. Comply with UL 248-1.
- E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.
- F. Voltage Rating: Suitable for circuit voltage.
- G. Class R Fuses: Comply with UL 248-12.
- H. Class CC Fuses: Comply with UL 248-4.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.
- B. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Do not install fuses until circuits are ready to be energized.
- B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION 262813

SECTION 262816.13
ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Enclosed circuit breakers.

1.02 RELATED REQUIREMENTS

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service 2013e (Amended 2017).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- H. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.
- I. UL 869A - Reference Standard for Service Equipment Current Edition, Including All Revisions.
- J. UL 943 - Ground-Fault Circuit-Interrupters Current Edition, Including All Revisions.
- K. UL 1053 - Ground-Fault Sensing and Relaying Equipment Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.
 - 1. Include characteristic trip curves for each type and rating of circuit breaker upon request.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed circuit breaker internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain ambient temperature between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C) during and after installation of enclosed circuit breakers.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ABB/GE: www.electrification.us.abb.com/#sle.
- B. Eaton Corporation: www.eaton.com/#sle.
- C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
- D. Siemens Industry, Inc: www.usa.siemens.com/#sle.

2.02 ENCLOSED CIRCUIT BREAKERS

- A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
- D. Short Circuit Current Rating:
 - 1. Provide enclosed circuit breakers with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.
 - 2. Label equipment utilizing series ratings as required by NFPA 70.
- E. Conductor Terminations: Suitable for use with the conductors to be installed.
- F. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.
- G. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
- H. Provide externally operable handle with means for locking in the OFF position.
- I. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

2.03 MOLDED CASE CIRCUIT BREAKERS

- A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
- B. Interrupting Capacity:
 - 1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:

2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
- C. Conductor Terminations:
 1. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
- D. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed circuit breakers are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed circuit breakers.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 260529.
- E. Install enclosed circuit breakers plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 260526.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with manufacturer's instructions and NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.6.1.1. Tests listed as optional are not required.
- D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
 1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.
- E. Test GFCI circuit breakers to verify proper operation.
- F. Correct deficiencies and replace damaged or defective enclosed circuit breakers.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

- A. Clean dirt and debris from circuit breaker enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 262816.13

This page intentionally left blank

SECTION 262816.16 ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 260573 - Power System Studies: Additional criteria for the selection of equipment and associated protective devices specified in this section.
- E. Section 262813 - Fuses.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum) 2013.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- H. UL 98 - Enclosed and Dead-Front Switches Current Edition, Including All Revisions.
- I. UL 869A - Reference Standard for Service Equipment Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 - 1. Include dimensioned plan and elevation views of enclosed switches and adjacent equipment with all required clearances indicated.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ABB/GE: www.electrification.us.abb.com/#sle.
- B. Eaton Corporation: www.eaton.com/#sle.
- C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
- D. Siemens Industry, Inc: www.usa.siemens.com/#sle.
- E. Substitutions: See Section 016000 - Product Requirements.
- F. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED SAFETY SWITCHES

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Short Circuit Current Rating:
 - 1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.
 - 2. Minimum Ratings:
 - a. Switches Protected by Class H Fuses: 10,000 rms symmetrical amperes.
 - b. General Duty Single Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.
 - c. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.
- G. Provide with switch blade contact position that is visible when the cover is open.
- H. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
 - 1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
- I. Conductor Terminations: Suitable for use with the conductors to be installed.
- J. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- K. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

- L. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- M. Heavy Duty Switches:
 - 1. Comply with NEMA KS 1.
 - 2. Conductor Terminations:
 - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed safety switches.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 260529.
- E. Install enclosed switches plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 260526.
- H. Provide fuses complying with Section 262813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.
- I. Identify enclosed switches in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
- D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 262816.16

This page intentionally left blank

SECTION 263600 TRANSFER SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Transfer switches for low-voltage (600 V and less) applications and associated accessories:
 - 1. Automatic transfer switches.
 - 2. Includes service entrance rated transfer switches.
 - 3. Includes bypass/isolation transfer switches.
 - 4. Remote annunciators.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 260573 - Power System Studies: Additional criteria for the selection of equipment specified in this section.
- F. Section 262100 - Low-Voltage Electrical Service Entrance.
- G. Section 262816.16 - Enclosed Switches: Safety switches not listed for use as transfer switch equipment.
- H. Section 263213 - Engine Generators: For interface with transfer switches.
 - 1. Includes code requirements applicable to work of this section.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- C. NEMA ICS 10 Part 1 - Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment 2020.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 110 - Standard for Emergency and Standby Power Systems 2019.
- G. UL 869A - Reference Standard for Service Equipment Current Edition, Including All Revisions.
- H. UL 1008 - Transfer Switch Equipment Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate compatibility of transfer switches to be installed with work provided under other sections or by others.
 - a. Generator provided by owner, installed by electrical contractor..
 - 2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
 - 3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 4. Coordinate the work with placement of supports, anchors, etc. required for mounting.
 - 5. Closed Transition Transfer Switches:
 - a. Coordinate source interconnection requirements with Utility Company.
 - b. Where applicable, coordinate the work to provide engine generators with isochronous governors suitable for closed transition transfer.
 - c. Coordinate the work to provide shunt trip breakers necessary for protection from source interconnection for longer than specified maximum interconnection time.

- d. Arrange for inspections necessary to obtain Utility Company approval of installation.
- 6. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features.
 - 1. Where applicable, include characteristic trip curves for overcurrent protective devices upon request.
- C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.
 - 1. Clearly indicate whether proposed short circuit current ratings are based on testing with specific overcurrent protective devices or time durations; indicate short-time ratings where applicable.
- D. Evidence of qualifications for installer.
- E. Source quality control test reports.
- F. Maintenance contracts.

1.06 QUALITY ASSURANCE

- A. Comply with the following:
 - 1. NFPA 70 (National Electrical Code).
 - 2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for system Level specified in Section 263213.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store transfer switches in accordance with manufacturer's instructions.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's instructions to avoid damage to transfer switch components, enclosure, and finish.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Transfer Switches:
 - 1. Same as manufacturer of engine generator(s) used for this project.
- B. Substitutions: See Section 016000 - Product Requirements.
- C. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor

accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

- D. Source Limitations: Furnish transfer switches and accessories produced by a single manufacturer and obtained from a single supplier.

2.02 TRANSFER SWITCHES

- A. Provide complete power transfer system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Applications:
 - 1. Neutral Switching (Single Phase, Three Wire and Three Phase, Four Wire Systems):
 - a. Unless otherwise indicated or required, provide neutral switching:
- D. Construction Type: Either "contactor type" (open contact) or "breaker type" (enclosed contact) transfer switches complying with specified requirements are acceptable.
- E. Automatic Transfer Switch:
 - 1. Transfer Switch Type: As indicated on the drawings.
 - 2. Transition Configuration: As indicated on the drawings.
 - 3. Voltage: As indicated on the drawings.
 - 4. Ampere Rating: As indicated on the drawings.
 - 5. Neutral Configuration: Solid neutral (unswitched), except as indicated.
 - 6. Load Served: As indicated on the drawings.
 - 7. Primary Source: As indicated on the drawings.
 - 8. Alternate Source: As indicated on the drawings.
- F. Comply with NEMA ICS 10 Part 1, and list and label as complying with UL 1008 for the classification of the intended application (e.g. emergency, optional standby).
- G. Do not use double throw safety switches or other equipment not specifically designed for power transfer applications and listed as transfer switch equipment.
- H. Load Classification: Classified for total system load (any combination of motor, electric discharge lamp, resistive, and tungsten lamp loads with tungsten lamp loads not exceeding 30 percent of the continuous current rating) unless otherwise indicated or required.
- I. Switching Methods:
 - 1. Open Transition:
 - a. Provide break-before-make transfer without a neutral position that is not connected to either source, and with interlocks to prevent simultaneous connection of the load to both sources.
 - 2. Neutral Switching: Either simultaneously switched neutral (break-before-make) or overlapping neutral (make-before-break) methods are acceptable.
 - 3. Obtain control power for transfer operation from line side of source to which the load is to be transferred.
- J. Service Conditions: Provide transfer switches suitable for continuous operation at indicated ratings under the service conditions at the installed location.
- K. Enclosures:
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1 or Type 12.
 - b. Outdoor Locations: Type 3R or Type 4.
 - 2. Provide lockable door(s) for outdoor locations.
 - 3. Finish: Manufacturer's standard unless otherwise indicated.
- L. Short Circuit Current Rating:
 - 1. Withstand and Closing Rating: Provide transfer switches, when protected by the supply side overcurrent protective devices to be installed, with listed withstand and closing rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.
 - 2. Short Time Rating: Where the requirement for selectivity is indicated, provide transfer switches with short time ratings suitable for the maximum short time delay setting of

the supply side overcurrent protective device.

M. Automatic Transfer Switches:

1. Description: Transfer switches with automatically initiated transfer between sources; electrically operated and mechanically held.
2. Control Functions:
 - a. Automatic mode.
 - b. Test Mode: Simulates failure of primary/normal source.
 - c. Voltage and Frequency Sensing:
 - 1) Undervoltage sensing for each phase of primary/normal source; adjustable dropout/pickup settings.
 - 2) Undervoltage sensing for alternate/emergency source; adjustable dropout/pickup settings.
 - 3) Underfrequency sensing for alternate/emergency source; adjustable dropout/pickup settings.
 - d. Outputs:
 - 1) Contacts for engine start/shutdown (except where direct generator communication interface is provided).
 - 2) Auxiliary contacts; one set(s) for each switch position.
 - e. Adjustable Time Delays:
 - 1) Engine generator start time delay; delays engine start signal to override momentary primary/normal source failures.
 - 2) Transfer to alternate/emergency source time delay.
 - 3) Retransfer to primary/normal source time delay.
 - 4) Engine generator cooldown time delay; delays engine shutdown following retransfer to primary/normal source to permit generator to run unloaded for cooldown period.
 - f. In-Phase Monitor (Open Transition Transfer Switches): Monitors phase angle difference between sources for initiating in-phase transfer.
 - g. Engine Exerciser: Provides programmable scheduled exercising of engine generator selectable with or without transfer to load; provides memory retention during power outage.
3. Status Indications:
 - a. Connected to alternate/emergency source.
 - b. Connected to primary/normal source.
 - c. Alternate/emergency source available.
4. Automatic Sequence of Operations:
 - a. Upon failure of primary/normal source for a programmable time period (engine generator start time delay), initiate starting of engine generator where applicable.
 - b. When alternate/emergency source is available, transfer load to alternate/emergency source after programmable time delay.
 - c. When primary/normal source has been restored, retransfer to primary/normal source after a programmable time delay. Bypass time delay if alternate/emergency source fails and primary/normal source is available.
 - d. Where applicable, initiate shutdown of engine generator after programmable engine cooldown time delay.

N. Remote Annunciators:

1. Remote Annunciator Mounting: Wall-mounted; Provide flush-mounted annunciator for finished areas and surface-mounted annunciator for non-finished areas unless otherwise indicated.
2. Transfer Switch Status Indications:
 - a. Connected to alternate/emergency source.
 - b. Connected to primary/normal source.
 - c. Alternate/emergency source available.

2.03 SOURCE QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Perform production tests on transfer switches at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of transfer switches are consistent with the indicated requirements.
- C. Verify that rough-ins for field connections are in the proper locations.
- D. Verify that mounting surfaces are ready to receive transfer switches.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Arrange equipment to provide minimum clearances and required maintenance access.
- D. Provide required support and attachment in accordance with Section 260529.
- E. Install transfer switches plumb and level.
- F. Unless otherwise indicated, mount floor-mounted transfer switches on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 033000.
- G. Provide grounding and bonding in accordance with Section 260526.
- H. Identify transfer switches and associated system wiring in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Prepare and start system in accordance with manufacturer's instructions.
- C. Automatic Transfer Switches:
 - 1. Inspect and test in accordance with NETA ATS, except Section 4.
 - 2. Perform inspections and tests listed in NETA ATS, Section 7.22.3. The insulation-resistance tests listed as optional are not required.
- D. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.04 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

- A. See Section 017800 - Closeout Submittals, for closeout submittals.
- B. See Section 017900 - Demonstration and Training, for additional requirements.

3.06 PROTECTION

- A. Protect installed transfer switches from subsequent construction operations.

3.07 MAINTENANCE

- A. See Section 017000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.
- B. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of transfer switches for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.
- C. Conduct site visit at least once every three months to perform inspection, testing, and preventive maintenance. Submit report to Owner indicating maintenance performed along with evaluations and recommendations.
- D. Provide trouble call-back service upon notification by Owner:
 - 1. Provide on-site response within 4 hours of notification.
 - 2. Include allowance for call-back service during normal working hours at no extra cost to Owner.

3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.
- E. Maintain an on-site log listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced.

END OF SECTION 263600

**SECTION 284600
FIRE DETECTION AND ALARM**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire alarm system design and installation, including all components, wiring, and conduit.
- B. Transmitters for communication with supervising station.
- C. Circuits from protected premises to supervising station, including conduit.
- D. Maintenance of fire alarm system under contract for specified warranty period.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping: Materials and methods for work to be performed by this installer.
- B. Designed using manufacturer's product-specific design software or based on manufacturer's pre-engineered design suitable for the application.
- C. Section 087100 - Door Hardware: Electrically operated locks and door holder devices to be monitored and released by fire alarm system.
- D. Section 211300 - Fire-Suppression Sprinkler Systems: Supervisory, alarm, and actuating devices installed in sprinkler system.
- E. Section 233300 - Air Duct Accessories: Smoke dampers monitored and controlled by fire alarm system.

1.03 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines current edition.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- C. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits 2002 (Corrigendum 2012).
- D. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. NFPA 72 - National Fire Alarm and Signaling Code Most Recent Edition Cited by Referring Code or Reference Standard.
- F. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. NFPA 601 - Standard for Security Services in Fire Loss Prevention 2015.
- H. UL 268 - Standard for Smoke Detectors for Fire Alarm Systems Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Proposal Documents: Submit the following with cost/time proposal:
 - 1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
 - 2. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
 - 3. Certification by Contractor that the system design will comply with Contract Documents.
 - 4. Proposed maintenance contract.
- C. Evidence of designer qualifications.
- D. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
 - 1. Copy (if any) of list of data required by authority having jurisdiction.
 - 2. NFPA 72 "Record of Completion", filled out to the extent known at the time.

3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
 4. System zone boundaries and interfaces to fire safety systems.
 5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
 6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
 7. List of all devices on each signaling line circuit, with spare capacity indicated.
 8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
 9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
 10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
 11. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
 12. Certification by Contractor that the system design complies with Contract Documents.
- E. Evidence of installer qualifications.
- F. Evidence of instructor qualifications; training lesson plan outline.
- G. Evidence of maintenance contractor qualifications, if different from installer.
- H. Inspection and Test Reports:
1. Submit inspection and test plan prior to closeout demonstration.
 2. Submit documentation of satisfactory inspections and tests.
 3. Submit NFPA 72 "Inspection and Test Form," filled out.
- I. Operating and Maintenance Data: See Section 017800 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
1. Complete set of specified design documents, as approved by authority having jurisdiction.
 2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
 3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
 4. List of recommended spare parts, tools, and instruments for testing.
 5. Replacement parts list with current prices, and source of supply.
 6. Detailed troubleshooting guide and large scale input/output matrix.
 7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
 8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.
- J. Project Record Documents: See Section 017800 for additional requirements; have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
 2. "As installed" wiring and schematic diagrams, with final terminal identifications.
 3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.
- K. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
 2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.
 3. Certificate of Occupancy.
- L. Maintenance Materials, Tools, and Software: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.
2. Furnish spare parts of same manufacturer and model as those installed; deliver in original packaging, labeled in same manner as in operating and maintenance data and place in spare parts cabinet.

1.05 QUALITY ASSURANCE

- A. Copies of Design Criteria Documents: Maintain at the project site for the duration of the project, bound together, an original copy of NFPA 72, the relevant portions of applicable codes, and instructions and guidelines of authorities having jurisdiction; deliver to Owner upon completion.
- B. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer, with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.
- C. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
 1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
 2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
 3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.
- D. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.
- E. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.
- C. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Alarm Control Units and Accessories - Other Acceptable Manufacturers:
 1. Honeywell Security & Fire Solutions/Fire-Lite: www.firelite.com/#sle.
 2. Honeywell Security & Fire Solutions/Silent Knight: www.silentknight.com/#sle.
 3. System Sensor..
 4. Provide control units made by the same manufacturer.
- B. Initiating Devices and Notification Appliances:
 1. Same manufacturer as control units.
 2. Provide initiating devices and notification appliances made by the same manufacturer, where possible.
- C. Substitutions: Not permitted.

2.02 FIRE ALARM SYSTEM

- A. Fire Alarm System: Provide a new automatic fire detection and alarm system:
 1. Provide all components necessary, regardless of whether shown in Contract Documents or not.
 2. Protected Premises: Entire building shown on drawings.
 3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
 - a. ADA Standards.

- b. The requirements of the local authority having jurisdiction .
 - c. Applicable local codes.
 - d. Contract Documents (drawings and specifications).
 - e. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
- 4. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
- 5. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.
- 6. General Evacuation Zones: Each smoke zone is considered a general evacuation zone unless otherwise indicated, with alarm notification in all zones on the same floor, on the floor above, and the floor below.
- 7. Program notification zones and voice messages as directed by Owner.
- 8. Fire Alarm Control Unit: New, located at Office Electrical Room.
- 9. Combined Systems: Do not combine fire alarm system with other non-fire systems.
- B. Supervising Stations and Fire Department Connections:
 - 1. Public Fire Department Notification: By on-premises supervising station.
 - 2. TELGUARD TG7-FS COMMERCIAL FIRE ALARM COMMUNICATOR FOR SOLE PATH COMMUNICATIONS.
 - a. THE TG7-FS SHALL BE PROVIDED AND INSTALLED BY THE EC USING A TEGUARD EXDL-O EXTERNAL MOUNT ANTENNA AND AN ACD-30 OR ACD-50 LOW LOSS ANTENNA CABLE.
 - b. FOR REGISTRATION AND ACTIVATION THE EC SHALL PROVIDE A ZONE LIST AND THE SERIAL NUMBER OF THE UNIT TO THE R+L SECURITY SYSTEMS MANAGER (DANNY HOLLINGSWORTH 937-382-1494 X1451).
 - c. CENTRAL STATION AND MONITORING INFORMATION WILL ALSO BE PROVIDED BY CONTACTING THE R+L SECURITY SYSTEMS MANAGER (DANNY HOLLINGSWORTH 937-382-1494 X1451).
- C. Circuits:
 - 1. Initiating Device Circuits (IDC): Class B, Style A.
 - 2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
 - 3. Signaling Line Circuits (SLC) Between Buildings: Class A, Style 2.
 - 4. Notification Appliance Circuits (NAC): Class B, Style W.
- D. Spare Capacity:
 - 1. Initiating Device Circuits: Minimum 100 percent spare capacity.
 - 2. Notification Appliance Circuits: Minimum 100 percent spare capacity.
 - 3. Speaker Amplifiers: Minimum 100 percent spare capacity.
 - 4. Fire Alarm Control Units: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.
- E. Power Sources:
 - 1. Primary: Dedicated branch circuits of the facility power distribution system.
 - 2. Secondary: Storage batteries.
 - 3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
 - 4. Each Computer System: Provide uninterruptible power supply (UPS).

2.03 FIRE SAFETY SYSTEMS INTERFACES

- A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
 - 1. Sprinkler water control valves.
 - 2. Dry-pipe sprinkler system pressure.
 - 3. Dry-pipe sprinkler valve room low temperature.
- B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
 - 1. Sprinkler water flow.
 - 2. Duct smoke detectors.
- C. HVAC:
 - 1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

- D. Doors:
 - 1. Electromagnetic Door Locks on Egress Doors: Unlock upon activation of any alarm initiating device or suppression system in smoke zone that doors serve as egress from. Refer to Section 087100.

2.04 COMPONENTS

- A. General:
 - 1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
 - 2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.
- B. Fire Alarm Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.
- C. Master Control Unit: As specified for Basis of Design above, or equivalent.
- D. Initiating Devices:
 - 1. Addressable Systems:
 - a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.
 - b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.
 - 2. Manual Pull Stations:
 - 3. Smoke Detectors: .
- E. Notification Appliances:
 - 1. Bells: .
 - 2. Strobes:.
- F. Circuit Conductors: Copper or optical fiber; provide 200 feet (60 m) extra; color code and label.
- G. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.
 - 1. Equipment Connected to Alternating Current Circuits: Maximum let through voltage of 350 V(ac), line-to-neutral, and 350 V(ac), line-to-line; do not use fuses.
 - 2. Initiating Device Circuits, Notification Appliance Circuits, and Communications Circuits: Provide surge protection at each point where circuit exits or enters a building; rated to protect applicable equipment; for 24 V(dc) maximum dc clamping voltage of 36 V(dc), line-to-ground, and 72 V(dc), line-to-line.
 - 3. Signaling Line Circuits: Provide surge protection at each point where circuit exits or enters a building, rated to protect applicable equipment.
- H. Locks and Keys: Deliver keys to Owner.
- I. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
 - 1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
 - 2. Provide one for each control unit where operations are to be performed.
 - 3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
 - 4. Provide extra copy with operation and maintenance data submittal.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.
- B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.
- C. Obtain Owner's approval of locations of devices, before installation.
- D. Install instruction cards and labels.

3.02 INSPECTION AND TESTING FOR COMPLETION

- A. Notify Owner 7 days prior to beginning completion inspections and tests.

- B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.
- D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.
- E. Provide all tools, software, and supplies required to accomplish inspection and testing.
- F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
- G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.
- H. Diagnostic Period: After successful completion of inspections and tests, Operate system in normal mode for at least 14 days without any system or equipment malfunctions.
 - 1. Record all system operations and malfunctions.
 - 2. If a malfunction occurs, start diagnostic period over after correction of malfunction.
 - 3. Owner will provide attendant operator personnel during diagnostic period; schedule training to allow Owner personnel to perform normal duties.
 - 4. At end of successful diagnostic period, fill out and submit NFPA 72 "Inspection and Testing Form."

3.03 OWNER PERSONNEL INSTRUCTION

- A. Provide the following instruction to designated Owner personnel:
 - 1. Hands-On Instruction: On-site, using operational system.
 - 2. Classroom Instruction: Owner furnished classroom, on-site or at other local facility.
- B. Administrative: One-hour session(s) covering issues necessary for non-technical administrative staff; classroom:
 - 1. Initial Training: 1 session pre-closeout.
- C. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
 - 1. Initial Training: 1 session pre-closeout.
- D. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

3.04 CLOSEOUT

- A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
 - 1. Be prepared to conduct any of the required tests.
 - 2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
 - 3. Have authorized technical representative of control unit manufacturer present during demonstration.
 - 4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
 - 5. Repeat demonstration until successful.
- B. Occupancy of the project will not occur prior to Substantial Completion.
- C. Substantial Completion of the project cannot be achieved until inspection and testing is successful and:
 - 1. Specified diagnostic period without malfunction has been completed.
 - 2. Approved operating and maintenance data has been delivered.
 - 3. Spare parts, extra materials, and tools have been delivered.
 - 4. All aspects of operation have been demonstrated to Owner.
 - 5. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
 - 6. Occupancy permit has been granted.
 - 7. Specified pre-closeout instruction is complete.

- D. Perform post-occupancy instruction within 3 months after Substantial Completion.

3.05 MAINTENANCE

- A. See Section 017000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.
- B. Provide to Owner, a proposal as an alternate to the base bid, for a maintenance contract for entire warranty period, to include the work described below; include the total cost of contract, proposal to be valid at least until 30 days after date of Substantial Completion.
- C. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
 - 1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
 - 2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
 - 3. Record keeping required by NFPA 72 and authorities having jurisdiction.
- D. Provide trouble call-back service upon notification by Owner:
 - 1. Provide on-site response within 2 hours of notification.
 - 2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
 - 3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.
- E. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.
- F. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.
- G. Comply with Owner's requirements for access to facility and security.

END OF SECTION 284600

This page intentionally left blank

SECTION 31 23 16FOUNDATION EXCAVATION AND BACKFILL

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, and equipment as necessary to perform all Earthwork for building foundations, including excavating, backfilling, filling, grading and related Work as specified herein and shown on the Drawings. Work includes, but is not necessarily limited to and for the following:
 - 1. Excavation and Backfill:
 - a. Mass Concrete Pours.
 - b. Building Column Footings.
 - c. Wall Footings.
 - d. Concrete Sidewalks and Curbs.
 - e. Guard Posts and Gate Post Foundations.
- B. Related Sections: The following related Work will be provided under other sections of the Specifications, as indicated:
 - 1. All Work Beyond Edge of Sidewalks and Curbs at Perimeter of each Building(s) - By Site Contractor.
 - 2. Site Preparation Work including Backfill at Parking Area (except for building guard posts) - By Site Grading Contractor.
 - 3. Building Column Footings and Wall Footings, Mass Concrete Pours - Section 03 00 50.
 - 4. Concrete Sidewalks, Pavements, and Floor Slabs, including Compacted Granular Fill Subbase under Slabs where indicated on the Drawings - Section 03 30 00.
 - 5. Earthwork in Connection with Mechanical and Electrical Utilities - Sections in Division 22 and Division 26.

1.02 LAYOUT OF WORK

- A. Provide the services of a competent Civil Engineer or Land Surveyor to establish all lines, levels, grades, bench marks and measurements required to layout the Work. Contractor shall be responsible for the accuracy of all layout Work, but shall not proceed with construction until layout is approved by the General Contractor.

- B. General Contractor shall furnish building base line(s), grade information, and each individual building corners.

1.03 SITE INFORMATION

- A. Site Examination: Contractor shall examine the site to ascertain the state thereof and to understand the complexities of the Work. Compare the site with the Drawings, the condition of the premises, the actual elevations, existing obstructions, areas of Work and other conditions that would affect the completion of the Work.

1.04 FIELD QUALITY CONTROL

- A. Soils Engineer Services: General Contractor shall select and pay for the services of a qualified Soils Engineer to control all phases of the Earthwork.
- B. Tests - General: Soils Engineer shall perform all tests required to assure compliance with the Specifications, and to determine the resulting backfills and earth structures are compatible with the original design assumptions. Provide full cooperation with the Engineer throughout the full duration of the Project operations.
- C. Responsibilities and Services: Soils Engineer will be directly responsible to the General Contractor, and all Earthwork operations, materials, equipment, procedures, shall be acceptable to, and to receive the approval of, the Soils Laboratory. The Owner will furnish the services of the Independent Testing Laboratory and will pay for all costs incurred, as specified in Section 01 45 23 - Testing and Inspecting Services.
- D. Field Tests: Field density tests are required to determine the compaction of each layer of fill and backfill. The method used in determining the density shall be the volumetric method or an alternate method as approved by the General Contractor.
 - 1. The percent compaction shall be determined for each field density test performed using the results of the moisture-density test representing the material tested.
 - 2. One (1) test will be required for each 2500 sq. ft. of area, for each layer of fill and for proof-rolling.
 - 3. Two (2) tests will be required for each 100 lin. ft. of wall backfill per foot of depth.

1.05 PROJECT CONDITIONS

- A. Do not use frozen fill material, and do not place fill material over a frozen subgrade, or a subgrade that is covered with ice, snow or water. Stop all operations when inclement weather causes the incorporation of excessive water into the soil.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Granular Fill: Sand, sand and gravel, gravel, crushed blast furnace slag or other approved granular material, of 3" maximum size, with no greater than 10% passing the #200 sieve, free from organic and deleterious materials.
- B. Concrete Fill: 1500 psi, 28 day strength, normal weight concrete.

- C. Source of Fill: All necessary building fill material shall be obtained from off-site sources approved by the Soils Engineer. All fill material shall be subject to approval by the Soils Engineer.
 - 1. Approved excavated material shall be used for fill and backfill OUTSIDE of building lines.
 - 2. Prior to using fill material found on site, secure approval from the Soils Engineer.

PART 3 - EXECUTION

3.01 PROTECTION

- A. General: Provide all materials and Work required to protect structures, utilities, sidewalks, pavements, and other facilities in areas of Work.
- B. Open Excavations: Provide barricades, warning signs, and lights, in compliance with governing safety regulations.

3.02 DESCRIPTION OF EARTHWORK

- A. Perform all Earthwork including excavating, filling and back-filling as required for the construction of building foundations, concrete walks and concrete slabs adjacent to the building and guard posts at building areas. Backfill within building lines and all interior column footings.
- B. In conjunction with the excavation below floor slabs, excavate for all footings and piers that have bottoms below the bottom elevation of existing grades.
- C. All building column and wall footings are of soil bearing design. Open excavate to depths required for construction of all footings and piers. Cross sectional area of concrete fill at any elevation shall be not less than cross sectional area of bottom of wall, pier or other construction supported by the fill.

3.03 EXCAVATION

- A. General: Perform all excavating required for the Work. Excavation shall consist of removing and disposing all material, of whatever type or nature disclosed, assumed to be earth and other materials that can be removed with a power shovel. If rock (as hereinafter defined) is encountered within the limits of excavation, immediately notify the Owner's Supervising Engineer, and do not proceed further until instructions are given and measurements are made for the purpose of establishing volume of "rock excavation".
 - 1. Contract Price Adjustment: "Rock excavation" shall be subject to contract price adjustment for rock excavation and removal. For such purposes of price adjustment, "rock" shall be material which cannot be broken and removed by power shovel, 1/2 cu. yd. bucket capacity, and requires the use of drills or explosives, and is, in addition, limited to the following:
 - a. Rock or stone in original ledge.
 - b. Hard shale in original ledge.
 - c. Boulders over one (1) cubic yard in trenches.
- B. Equipment: Provide adequate, proper and suitable equipment to perform all Excavation Work, and to complete such Work within the prescribed time limits. Use mechanical equipment to remove earth wherever possible. Supplement mechanical excavation with hand excavation where required.

- C. Excavation Requirements: Excavations for footings, foundations, walks, piers, and similar below ground Work shall be of width as required for construction, for inspecting, placing and removing forms, and shall be a minimum of 1'-0" outside of the surface of the concrete, except excavations for concrete footings may be of exact size if earth banks will stand.
- D. Design and Bearing Capacities: Footings and foundations are of soil bearing design or as indicated on the Drawings and shall bear on firm, undisturbed, soil capable of supporting the loadings. If satisfactory bearing capacities are not found at elevations for bottoms of foundations where indicated on the Drawings, deepen and/or enlarge the excavations as directed by the Soils Engineer, and the Contract Sum will be adjusted for the differing amount of Work performed.
- E. Detrimental and Remedial Operations: Filling or backfilling under foundations with earth, sand, gravel or similar material will not be permitted. If this Contractor by error, excavates below foundation bottoms; Contractor shall backfill to correct elevations with 1500 psi strength concrete at own expense. Approved excavated material shall be used for fill and backfill outside of building lines. Material not suitable for fill and backfill shall be disposed off-site by this trade, at own expense.
- F. Underground Utilities: Should underground utilities be encountered during Excavation Work, consult with the General Contractor to determine if the service is in use or has been abandoned. If the service is in use, have the Utility Company relocate the service. If the service has been abandoned, cut the utility at the face of the excavation, and plug permanently with a concrete or steel cap. Repair damage to existing utilities as directed by Utility Company.
- G. Protection: Protect excavated areas from weather, frost, and construction damage. Cover holes and trenches when Work is not in progress. Fence and barricade changes in plane of more than 45° with the horizontal and 4' in height.
- H. Cleaning and Trimming: Clean, level, and hand trim excavations as required for concrete construction, just prior to placement of concrete. Trim bottom of excavations for Structural Concrete Work to smooth, level planes at the required elevations. Where bottoms of continuous footings or foundations are at different elevations, step the bottoms at maximum 2 horizontal to 1 vertical ratio as required, without sloping. Dispose of all excavated material as directed by the General Contractor.

3.04 WATER CONTROL

- A. Excavations: Keep all excavations free from water at all times, including excavations having bottom elevations below the water table, up to such time that concrete and masonry mortar has attained initial set. Refer to Section 02 32 00 - Soil Investigation Reports for borings.
- B. Equipment/Systems: Provide pumps, well points or other systems as required by field conditions. Pumps shall be operated as required to accomplish the above; on a twenty-four (24) hour basis if necessary.

3.05 SHEETING, SHORING AND BRACING

- A. General: Provide adequate sheeting, shoring and bracing designed by a Registered Engineer licensed in the State of the proposed Project as required for the support of earth banks; in such quantities as to insure expeditious completion of the Work. Take full responsibility for maintaining soil banks and bottoms, and for any damage to adjoining or adjacent Work, such as buildings, pavements, floor slabs, sewers, pipe lines, conduits, or any other underground or overhead structures, due to lateral movements, cave-in, heaving or any other earth movement caused by operations under this Contract. The Contractor's Engineer shall submit his earth retention system design to the Architect for review.
- B. Bracings and Sheeting: Maintain bracing in place until immediately before filling, and then remove by stages as the filling progresses. Do not completely withdraw sheeting until filling is complete. Steel sheeting may be left in place, but all wood shall be removed.

3.06 FILL AND BACKFILL

- A. Fill Materials: Use approved granular material where required for fill and backfill Work inside of the building addition. Use concrete fill for backfilling of excavations for Structural Concrete Work that have been excavated below the design elevations.
- B. Placement of Fill and Backfill: Spread granular backfill materials in uniform layers parallel to the finish grade elevations, filling holes and low areas first. Place materials in layers not over 9" thick when compacted by rollers; not over 4" thick when compacted with machine tampers; all thicknesses loose measurement. Thoroughly compact each layer before the next layer is placed. Place fill and backfill against free standing walls on both sides at the same time. If fill and backfill is required against one side of wall only, properly brace the wall on the other side. Debris, frozen earth, or large lumps will not be permitted.
- C. Removal of Unsatisfactory Materials and Inspection: Remove all stones, stone fragments and rubble larger than 3" in any dimension in fill and backfill. Backfill sub-structure Work after all such Work has been inspected and approved by the General Contractor as soon as possible.
- D. Compaction and Compacting Equipment: Thoroughly compact each layer of granular fill and backfill following spreading as closely as possible. Provide compaction equipment of type best suited to achieve the desired results. In general, use pneumatic wheeled or vibrating rollers as approved by the General Contractor. Compact portions of the fill that are too close to structures or other obstacles to permit the use of rolling equipment, and other portions that the rollers cannot reach for any reason, with power tampers. Operate compacting equipment on each layer until the entire area has been thoroughly and uniformly compacted to a density of not less than 95% maximum unit weight, at optimum moisture, as determined by ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
- E. Moisture Content: All material to be compacted shall contain the amount of moisture required to obtain the optimum compaction. Sand shall be as dry as possible. Any material that is too wet shall be dried to proper moisture content by allowing to air dry or by blending dry material with the wet material; or shall be removed from the fill area. Use particular care to prevent fine granular material from "bulking".
- F. Field Compaction Test Results and Required Action: If the results of a field compaction test indicate that a lift has not been compacted to the required density, recompact the area prior to the placement of additional material until the specified density has been obtained. If such lifts have been covered, remove all of the overlaying layers of fill, and recompact until specification requirements have been met.

END OF SECTION

SECTION 32 31 13CHAIN LINK FENCE AND GATES

The requirements of the "General Conditions", the "Supplementary Conditions", and "Division 1" sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Furnish all labor, materials, equipment, facilities, transportation, and services necessary to furnish and install Temporary Interior Chain Link Fence and Gates as shown on the Drawings and as specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Commercial Chain-Link Fence System.
 - 2. Gates.
 - 3. Cantilever Sliding Gate and Operator.
 - 4. Miscellaneous Hardware and Setting Accessories.
- B. Related Sections: The following Work will be provided for under other sections of the Specifications, as indicated:
 - 1. Concrete Foundation Work - Section 03 00 50.
 - 2. Rough Carpentry - Section 06 10 00.
 - 3. Foundation Excavation and Backfill - Section 31 23 16.

1.02 QUALITY ASSURANCE

- A. Fencing Guidelines: Material specifications for chain link fence as listed in Chain-Link Manufacturers Institute (CLFMI) Product Manual.
- B. Manufacturer: Company shall have manufacturing facilities in the United States with a minimum five (5) years experience specializing in manufacturing of chain link fence products.
- C. Fence Contractor: Contractor having five (5) years experience installing similar projects in accordance with ASTM F567- Standard Practice for Installation of Chain-Link Fence.
- D. Requirements of Regulatory Agencies: Chain Link Fence Gates shall be furnished and installed in strict compliance with the laws, codes, ordinances and regulations of the public authorities having jurisdiction, including Title III of The Americans With Disabilities Act (ADA), Public Law 101-336.

1.03 SUBMITTALS

- A. General: Submit Shop Drawings, Product Data, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Shop Drawings: Prepare and submit completely detailed Shop Drawings showing materials, construction and installation details, and layout of Work.

1. Shop Drawings shall include, but not be limited to, details illustrating fence height, size and posts, rails, gates, footings, and barb wire and all accessories.

1.04 PRODUCT DELIVERY, HANDLING AND STORAGE

- A. Delivery: Deliver all products, materials, accessories, etc. at location designated by the General Contractor.
- B. Storage: Store all products and materials at the site above the ground. Handle all materials in a manner that will prevent damage to same. Do not place materials directly on ground. Do not dump materials in piles. Damaged materials will not be acceptable and shall be removed from the site.

1.05 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance of the installation.

PART 2 - PRODUCTS

2.01 CHAIN LINK FENCE AND GATE MANUFACTURERS

- A. Master Halco®, Inc., One City Blvd. West, Suite 900 Orange, CA 92868, (800)229-5615; www.masterhalco.com.
- B. Merchants Metals, Inc., 400 North Sam Houston Parkway East, Suite 1200, Houston, TX 77060, (866)888-5611 or (281)372-3800; www.merchantsmetals.com.

2.02 FENCE AND GATE COMPONENTS

- A. General: Posts shall be of sufficient length to provide not less than 8" setting into hot-dipped galvanized steel post sleeves, unless otherwise indicated on the Drawings.
- B. Materials:
 1. Fence Height: As required by standard 6'-0", 7'-0", and 8'-0" high wire fabric as indicated on the Drawings.
 2. Fabric: #6 gauge (0.194" diameter), chain link open hearth steel wire, hot-dipped galvanized after weaving with minimum coating of 2.0 ounce of zinc per square foot, or aluminum coating with .40 ounces per square foot, woven in a 2" diamond mesh. Top and bottom selvage shall be knuckled.
 3. Stretcher Bars and Miscellaneous Fastening Devices: Stretcher bar bands, tie wires, hog rings, couplings, nuts, stretcher bars, bolts, and miscellaneous fastening devices shall be manufacturer's standard for heavy construction fence and comply with ASTM Standard F626, and ASTM Standard A824 for tension wires. Stretcher bars shall be one-piece lengths equal to full height of fabric with a minimum cross section of 3/16" x 3/4".
 4. Line-Posts: 2.375" O.D. Type I steel pipe, weight 3.65 lbs. per foot, or 2.375" O.D. Type II steel pipe, weight 3.12 lbs. per foot, hot-dipped galvanized.

5. Top and Bottom Rails: 1-5/8" O.D. steel pipe, weight 2.72 lbs. per foot. Furnish with self-centering sleeve rail coupling for fastening to line, end and corner posts.
6. End, Corner, and Pull Posts: 2-7/8" O.D. steel pipe, weight 5.79 lbs. per foot, hot-dipped galvanized.
7. Gate Posts: 2-7/8" O.D. steel pipe, weight 5.79 lbs. per foot, hot-dipped galvanized.
8. Swing Gates:
 - a. Frame: 2" O.D. Type I steel pipe, weight 2.60 lbs. per foot; or 1.90" O.D. Type I steel pipe, weight 2.72 lbs. per foot, or 1.90" O.D. Type II steel pipe, weight 2.28 lbs. per foot, hot-dipped galvanized. Each frame shall be equipped with 3/8" diameter adjustable truss rods.
 - b. Fabric: As specified herein.
 - c. Hinges: Hot-dipped galvanized pressed steel or malleable iron to suit gate size, non-lift off type. Hinges shall be offset to permit 180 degree opening.
 - d. Hardware (Per pair):
 - 1-1/2 Pair of malleable iron hinges per leaf.
 - 1 Automatic gate keeper per leaf, such as Merchants Metals "Duckbill Holdback Assembly" hinges for holding gate in open position.
 - 1 Plunger rod with flush plate anchor.
 - 1 Locking device forked type, (to permit operation from either side), with padlock eyes requiring one (1) padlock for locking both leaves.
9. Barbed Wire Supporting Arms: Galvanized pressed steel barb arm per ASTM F626 with provisions for attaching barbed wire. Provide arms with loop hole for applications with top rail. Arms shall withstand 250 lb. (113.5 kg) downward pull at outermost end of arm without failure. Arms provide an additional 13 in. (330 mm) in height. Type 1, 45° 3 strand single arm.

2.03 CANTILEVER SLIDING GATE

- A. Model: SurTrac aluminum cantilever sliding gate with enclosed aluminum track and hardware manufactured to comply with ASTM F-1184.
- B. Gate Frames: Fabricate chain link cantilever slide gates in accordance with ASTM F-1184, Type II, Class 2, using aluminum members conforming to ASTM B221, alloy and temper 6061-T6. Vertical members shall be 2 inch (50mm) square aluminum, weighing 1.13 lb./ft., 2 inch x 4 inch aluminum bottom frame member weighing 1.73 lb./ft., and a one-piece aluminum track/frame member weighing a minimum of 4.621 lb./ft. for Single Track and 7.95 lb./ft. for Dual Track. The 2 inch square frame member of said track/frame shall have a wall thickness of not less than .250 inches on all four sides. Aluminum alloy used shall be 6061-T6 only. Internal uprights shall be 2-inch square aluminum spaced equally at no more than 6 feet on center subdividing the gate frame into panels. Weld all members together forming a rigid one-piece frame integral with top track. Provide 2 truck assemblies for each gate leaf, except as indicated for gates larger than 30' (9144mm). Frame sizes over 27' (8230mm) in length shall be shipped in 2 parts and field spliced with special attachments provided by the manufacturer.
- C. Finish: Natural Aluminum.
- D. Chain Link and Barb Wire: Mesh size, mesh gauge and barb wire to match site fence.

- E. Trussing: Each bay shall be cross-trussed by means of 1/4" cable with adjustable turnbuckles. Trusses will maintain the structural integrity of the gate while allowing for expansion and contraction of aluminum in varying weather conditions.
- F. Top Track/Rail: Enclosed combination one-piece track and rail, aluminum extrusion with weight of: Openings up to 30'; 4.62 lbs./ft. Top track/rail to be a single formed profile with integrated center stabilizing web without welding. All wall thicknesses to be 0.25".
- G. Truck Assembly: Swivel type, zinc die coated steel, with 6 sealed lubricant ball bearing rollers, 2 inches (50 mm) in diameter by 9/16" (14 mm) in width, and 2 side rolling wheels to ensure truck alignment in track. Mount trucks on post brackets using 7/8" (22 mm) diameter ball bolts with 5/8" (16 mm) shank. Truck assembly shall withstand same reaction load as track 2,000 # (907.2 kg.) revised 3/20/2008.
- H. Gate Hangers, Brackets, Guide Assemblies and Receivers: Malleable iron or steel, galvanized after fabrication.
- I. Bottom Guide Wheel Assemblies: Each assembly shall consist of two, 3" (75 mm) diameter wheels, straddling bottom horizontal gate rail, allowing adjustment to maintain gate frame plumb and in proper alignment. Attach one assembly to each support post.
- J. End Plug: After gate has been installed, both ends of the combination track/frame member shall be closed off with a shock absorbing plastic block that shall also serve as a stop bracket.
- K. Gate Posts: For gates under 31' - 0" (9449 mm): galvanized steel 4" (101.6 mm) OD schedule 40 pipe, ASTM F 1083, weighting 9.1 lb./ft. (13.6 kg/m). Provide 1 latch post and 2 support posts for single slide gates and 4 support posts for double slide gates.

2.04 CANTILEVER SLIDING GATE OPERATOR

- A. Manufacturer: HySecurity, (253)867-3700 or (800)321-9947, www.hysecurity.com.
- B. Model: SlideSmart CNX 15.
- C. Accessories:
 - 1. Photo Eye Kits.
 - 2. ASO Edge Sensors.
 - 3. In-Ground Vehicle Loop Detectors.

2.05 BARBED WIRE AND BARBED TAPE

- A. Barbed Wire: ASTM A121 design number 12-4-5-14R, 12-1/2 gauge, 0.099" (2.51 mm) Type Z Class 3, 0.80 oz/ft² (245 g/m²) zinc coated double-strand twisted line wire with 14 gauge, (0.080") (2.03 mm) Type Z Class 3, 0.70 oz/ft² (215 g/m²) zinc coated 4 point barbs spaced an average of 5" (127 mm) on center.
- B. Barbed Tape: Stainless steel barbed tape shall comply with ASTM F1910.

2.06 CONCRETE

- A. Concrete Footings: Concrete for setting posts into concrete footings shall be Portland Cement complying with ASTM Standard C150, aggregates complying with ASTM Standard C33, and clean water. Mix materials to obtain concrete with a minimum 28 day compressive strength of 2500 p.s.i.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Fence and Gates: Install chain link fence, including posts and gates, at locations shown and/or indicated on Drawings, in accordance with manufacturer's printed specifications, approved Shop Drawings, Architect's Drawings, and as specified herein.
- B. Post Installation:
 - 1. Spacings: Posts shall be spaced as noted on the Drawings.
 - 2. Installations in Concrete Footings: Unless otherwise indicated on the Drawings or required by field conditions, set posts into concrete footings.
- C. Rail Installation:
 - 1. Fastenings: Securely fasten with self-centering rail couplings, the top and bottom rails to end, terminal and corner posts.
 - 2. Intermediate Rails: Install intermediate rails, centered between the top and bottom rails at locations as indicated on the Drawings.
 - 3. Note: At 6'-0" high fences, omit intermediate and bottom rails.
- D. Chain Link Fabric: Install fence fabric, stretching tight but not enough to pull out of shape. Secure fabric to posts and to top, intermediate, and bottom rails in accordance with best practice. Fasten fabric to top and bottom rails with galvanized iron clips.
 - 1. Note: At 6'-0" high fences, install not less than #6 gauge tension wires in lieu of intermediate and bottom rails.
- E. Gates: Install gates, including all required hardware, where indicated on the Drawings. Installed gates shall operate smoothly, without any binding.

3.02 OPERATED GATE INSTALLATION

- A. Install gates plumb, level, and secure for full opening without interference. Gate movement shall not be initiated by gravity when an automated gate operator is disengaged/disconnected per ASTM F-2220 (Section 4.9).
- B. There shall be a maximum gap of 2-1/4" (57 mm) between the horizontal plane of the moving gate panel and any fixed obstacle (support posts, "fall-over" posts, hardware, pilaster, etc.) except that said obstacle be more than 16" from the moving horizontal plane of the gate panel per ASTM F-2200 (Section 6.1.4.).
- C. Gate Receiver Guides shall be recessed behind the leading edge of the receiver post or any other fixed object per ASTM F-2200 (Section 6.1.6).
- D. No device designed to provide activation for the automated gate operator is to be installed within 6' of the horizontal plane of the gate panel per UL-325.
- E. All Operated Chain-Link Cantilever slide gates are required to have Gate Warning Placards fully visible to the approach on both sides of the gate per UL-325.
- F. Attached hardware by means which will prevent unauthorized removal.

- G. Adjust hardware for smooth operation.
- H. All operated gate installations to conform to all applicable federal, state, and local codes as well as: ASTM F-567, ASTM F-1184, ASTM F-2200, and Underwriters Laboratory UL-325 safety standards.

3.03 TESTING

- A. Gates: Completed gate installation shall be tested, adjusted and left in good working order.

3.04 CLEAN-UP

- A. Work Required: Clean-up any Work soiled in the performance of the Work under this section.
- B. Debris and Waste Materials: During progress of the Work, upon completion of Work, and before final acceptance of the Work, keep the premises free of debris and waste materials resulting from Work of this section. Remove all construction debris and rubbish to central area designated by General Contractor, for general clean-up by General Contractor, or if directed by General Contractor to remove from the site and legally dispose.
- C. Unused Materials, Tools, and Equipment: Upon completion of Work and before final acceptance of the Work, clean-up all scraps, rubbish, containers, and other such debris, and remove all unused materials, tools, and equipment from the site.

END OF SECTION

SECTION 32 31 29WOOD FENCES AND GATES

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL1.01 SCOPE

- A. Work Included: Provide all labor, materials, and services necessary for Wood and Metal Gate Work indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Wood and Metal Gates and Hardware at Trash Enclosures.
- B. Related Sections: The following related Work will be provided under other sections of the Specifications, as indicated:
 - 1. Chain Link Fence and Gates - Section 32 31 13.
 - 2. Installation of Steel Guard Posts for Gates - Section 03 30 00.
 - 3. Masonry Work - Section 04 20 00.
 - 4. Steel Guard Posts - Section 05 50 00.
 - 5. Field Finishing of Wood Fences and Gates - Section 09 91 13.

1.02 MEASUREMENTS

- A. Contractor shall obtain field measurements of adjoining Work as required to locate and fit the Work of this section. Contractor shall be responsible for the accurate fitting of materials together.

1.03 SUBMITTALS

- A. General: Submit Shop Drawings and Product Data to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.
- B. Shop Drawings: Prepare complete Shop Drawings, showing all components and details of materials, methods of attachment, layout and erection details, including finish hardware.
- C. Product Data: Provide manufacturer's data sheets on each composite lumber product to be used.

1.04 PRODUCT DELIVERY AND STORAGE

- A. General: Protect all materials from the weather during transit and storage at the site. Store materials above the ground, in sheds if possible. If outdoor storage is required, house materials under waterproof coverings. Do not deliver materials to the job site until required for installation.
- B. Finish Hardware: Provide all finish hardware required for gates.

1.05 WARRANTY

- A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and make good at own expense any imperfections which may develop during the warranty period and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

PART 2 - PRODUCTS

2.01 WOOD

- A. General: Lumber shall conform to Voluntary Products Standard PS-20 "American Lumber Standards". Grades shall conform with the current grading rules of the Lumber Manufacturer's Association; under whose rules the lumber is manufactured.

2.02 WOOD TREATMENTS

- A. Preservative Treatment: Wood shall be pressure impregnated with Chromated Copper Arsenate (CCA) conforming to AWPB Standard P5, and bear mark (such as Wolmanized®) certifying conformance. Process shall comply with FSTT-W-571 and AWPB Commodity Standards.

2.03 ROUGH HARDWARE

- A. General: Provide all rough hardware such as spikes, nails, screws, bolts, anchors, brackets, necessary for the Work.
- B. Bolts, Nuts and Washers: Provide hot-dipped galvanized steel bolts, nuts and washers for bolting Work. Select length of bolts to suit thickness of material being joined.
- C. Nails: Provide nails conforming with Federal Specification FF-N-105a, except as otherwise specified. Use galvanized steel nails as required for Work. Zinc coating on galvanized nails shall conform with Article 3.2.1 of the Fed. Spec. Do not use aluminum nails.

2.04 WOOD GATES

- A. General: Construct wood gates with hardware, steel pipe frames, and accessories, as detailed on the Drawings.
- B. Wood: 1" x 6" Douglas Fir, with preservative treatment specified herein, S4S, Standard or better, seasoned dry with moisture content of 19% or less.
- C. Hardware and Steel Pipe Frame Material Manufacturers:
1. Master Halco®, One City Blvd. West, Suite 900 Orange, CA 92868, (800)229-5615; www.masterhalco.com.
 2. Merchants Metals, 800 Whitney Street, P.O. Box 1682, Brighton, MI 48116, (800)338-7684 or (810)227-3036; www.merchantsmetals.com.
- D. Frame and Finish Hardware Materials:
1. Frames: Hot-dip galvanized, nominal 2" round steel tubing, weighing not less than 3.65 lbs. per lineal foot. Each gate frame shall be equipped with 3/8" diameter adjustable truss sag rod and turnbuckles.

2. Gate Hinges: Hot-dip galvanized, pressed steel, or malleable iron to suit gate size, non-lift off type. Hinges shall be offset to permit 180 degree opening.
3. Finish Hardware for Gates (Per Pair) including the following:
 - a. 6 Weld-on two piece pin style hinges, weight capacity to handle gate weight.
 - b. 1 Plunger rod(s) with flush plate anchors.
 - c. 1 Forked type latching/ locking device with padlock eyes requiring one (1) padlock for latching and locking both leaves.
 - d. 2 Heavy duty pull handles, one for each side of gate.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Assembly: Secure wood boards to steel gate frames as detailed on the Drawings. Neatly and accurately fit together with all necessary hardware required to make secure.
- B. Rough Hardware: Install all items of rough hardware as necessary for the execution of the Work.
- C. Finish Hardware: Install all finish hardware as specified herein. Install and adjust all hardware properly, in accordance with the manufacturer's instructions. Attach and secure the hardware so that no parts are damaged.

3.02 DAMAGED MATERIALS

- A. Repair or replace all damaged materials to the satisfaction of the Owner and/or Architect.

3.03 CLEAN-UP

- A. Adjacent Finish Work: Clean-up and repair adjacent finish Work which is soiled, marred, or damaged by the Work of this section, at own expense.
- B. Debris and Waste Materials: During progress of the Work the premises shall be kept free of all debris and waste materials resulting from the Work of this section. During progress of the Work, and upon completion and before final acceptance of the Work, remove all construction debris and rubbish from the site and dispose of legally. Upon completion and before final acceptance of the Work, all debris, rubbish, unused materials, tools, and equipment shall be removed from the site.

END OF SECTION

